Operator Logo

ZXCTN 6500 V1.00.10 Product Description

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ZXCTN 6500 V1.00.10 Product Description

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1 Overview

With large-scale deployment of 3G/LTE network and the implementation of full-service development strategy, IP-based services dominate the bearer network and have new requirements for technological structure, bandwidth, bearing efficiency, dispatching flexibility, cost and QoS.

Under this backdrop, ZTE launches a new generation of core trunkline packet transport product – ZXCTN 6500 series (6500-8/6500-16/6500-32). With T level super-large capacity, 300mm depth, and rich service slots, it supports 40GE high-speed interface, high/low-speed slot separated design, powerful TDM processing capability, TPS protection, and all-around three-dimensional protection solution, which effectively satisfy the core and trunk line layer needs in PTN packet transport network, greatly cut CAPEX & OPEX and help carrier networks and services with long-term evolution and development in the IP era.

2 Highlights

2.1 Super large capacity and T-level high-end PTN

1.28T access capacity and up to 14.4T back plane capacity meet the long-term evolution needs of large bandwidth, LTE and comprehensive service access of the network.

2.2 Full series support 40GE and start large bandwidth times

ZXCTN 6500 full series products support 40GE. Breaking through the traditional 10GE platform limits, it provides powerful guarantee fro LTE bearing and comprehensive service access and bearing, and starts the large bandwidth times.

Large bandwidth – 40GE full packet length wire-speed forwarding. Single slot supports smooth upgrade to 100GE.

2.3 Full series support CEP, large-granularity SDH 155M large-customer trunk line transmission interface

ZXCTN 6500 full series support CEP and completely satisfy large-granulairty TDM interface bearing needs.

Single host provides up to 96 CEP 155M interface, which effectively meets large-granulairty large-customer trunkline transmission needs.

2.4 Small size with 300mm depth and “slim style” design saves space, equipment room and investment

ZXCTN 6500 uses 300mm depth “slim style” design, breaks through the 600mm depth design scheme of the first generation core level PTN device to implement pre-operatoin and pre-maintenance. It can be installed against the wall to save the space, improve the space utilization of core aggregation equipment room, and save the investment.

2.5 Various service slots completely meet comprehensive service transport

It uses full-height and semi-height slot compatibility design, with which it can meet 2G, 3G, LTE and large customer service transport needs, and satisfy long-term development needs of comprehensive service transport. Therefore, ZXCTN 6500-16 can also provide 44 service slots.

2.6 “High/low-speed slot differentiation + uncoupling” innovative design has high slot utilization and high reliability

It uses innovative “high/low-speed differentiation + uncoupling” design and 1+1 redundancy low-speed service switching proxy to process all low-speed services. There are no limits for low-speed service cards.

High/low-speed slots are differentiated, slots are efficiently used, and service access capability is maximized. Low-speed service expansion doesn’t occupy high-speed service slots without impact on high-speed services, which greatly improves slot utilization.

3 Functions and features

3.1 Service Processing Capability

ZXCTN 6500 service process capability includes switching capability and service access capability.

3.1.1 Switching capability

ZXCTN 6500 supports the packet-based service switching. ZXCTN 6500 service processing capability is shown in 错误！未找到引用源。.

Table 3-1 ZXCTN 6500 capacity and packet forwarding rate

Service Processing	ZXCTN 6500-8	ZXCTN 6500-16	ZXCTN 6500-32
Backplane capacity bps	3.6T	7.2T	14.4T
Switching capacity bps	1.44T	2.88T	5.76T
Packet forwarding rate pps	476.16M	952.32M	1904.64M

3.1.2 Service access capability

ZXCTN 6500 can access services via multiple interfaces. ZXCTN 6500 service interface type and number are shown in 错误！未找到引用源。, 3-3 and 3-4.

Table3-2 ZXCTN 6500-8 maximum access capability

Interface	Interface Type	Interface per board	Overall interface
Ethernet	40GE(Optical)	1	8
	10GE (Optical)	4	32
	GE (Optical)	8/16	208
	GE (Electrical)	8/16	208
	FE (Optical)	8/16	208
	FE (Electrical)	8/16	208
PDH	E1	63	252
STM-N	Ch. STM-1	4	40
	CEP STM-1	4	40

Table 3-3 ZXCTN 6500-16 maximum access capability

Interface	Interface Type	Interface per board	Overall interface
Ethernet	40GE(Optical)	1	16
	10GE (Optical)	4	64
	GE (Optical)	8/16	448
	GE (Electrical)	8/16	448
	FE (Optical)	8/16	448
	FE (Electrical)	8/16	448
PDH	E1	63	504
STM-N	Ch. STM-1	4	96
	CEP STM-1	4	96

Table 3-4 ZXCTN 6500-32 maximum access capability

Interface	Interface Type	Interface per board	Overall interface
Ethernet	40GE(Optical)	1	32
	10GE (Optical)	4	128
	GE (Optical)	8/16	512
	GE (Electrical)	8/16	512
	FE (Optical)	8/16	512
	FE (Electrical)	8/16	512
STM-N	Ch. STM-1	4	128
	CEP STM-1	4	128

Note: Ch. =Channelized

3.2 Interface type

3.2.1 ZXCTN 6500 interface type and number

ZXCTN 6500 supports multiple interfaces, as shown in Table 3-5.

Table 3-5 ZXCTN 6500 service interface types

Type	Description	Remark
FE interface	Electrical interface: 10/100BASE-TX Optical interface: 100BASE-FX	UNI interface/NNI interface (optical interface)
GE interface	Electrical interface: 1000BASE-T Optical interface: 1000BASE-SX, 1000BASE-LH, 1000BASE-LH, 1000BASE-LH1/LH2, 1000BASE-ZX	UNI interface/NNI interface
10GE interface	Optical interface: 10GBASE-SR/SW, 10GBASE-LR/LW,	UNI interface/NNI interface
40GE interface	Optical interface: 40GBASE-LR, 40GBASE-ER4	UNI interface/NNI interface
STM-1	STM-1 optical interface: S1.1, L1.1,	UNI interface

Type	Description	Remark
interface	L1.2	
E1 interface	E1 interface	UNI interface (ZXCTN 6500-32 doesn't support E1 interface temporarily.)

ZXCTN 6500 also supports NM interface, clock interface and alarm interface, as shown in Table 3-6.

Table 3-6 ZXCTN 6500 auxiliary interface type and number

Auxiliary interface	Number supported (card/device)	Parameter
BITS clock output interface	1/2	It provides 75 Ω E1 BITS interface. it can set clock type of 2MHz or 2 Mbit/s by network management.
BIT clock input interface	1/2	It provides 75 Ω E1 BITS interface. it can set clock type of 2MHz or 2 Mbit/s by network management.
Time synchronization interface (1PPS+1ToD)	1/2	It can be set as input or output interface by network management.
Network management interface Qx	1/2	10M/100M/1000M Ethernet electrical interface.
Alarm cascading input interface	4/8	Switch signal. 4-port alarm cascading input signal share one RJ45 physical
External alarm input interface	4/8	Switch signal. 4-port alarm cascading input signal share one RJ45 physical
Alarm output interface	4/8	Switch signal provides minor, major and critical alarm and ring information output for display at array cabinet. 4-port alarm output signal share one RJ45 physial interface.

Auxiliary interface	Number supported (card/device)	Parameter
Subrack alarm display interface LAMP	5/10	TTL electrical level alarm signal, providing warning, minor, major, and critical alarm and ring information ouitput, used for cabinet alarm chassis or cabinet indicator. 5-port alarm display signal share one RJ45 physical interface.

4 System Architecture

4.1 The Hardware Architecture

4.1.1 The overall hardware architecture

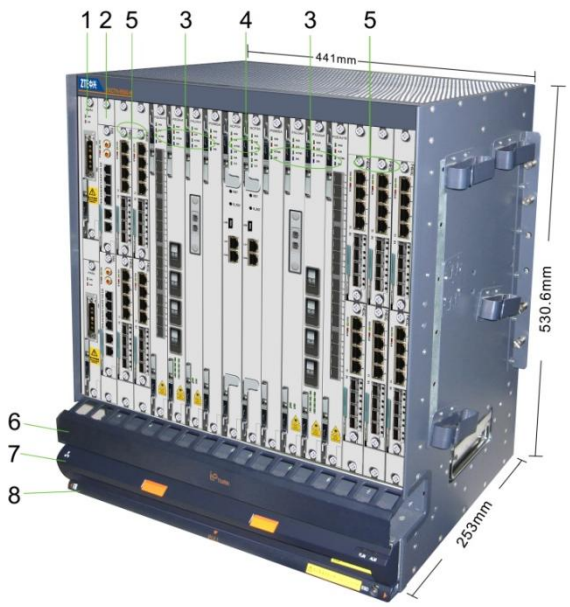
ZXCTN 6500 uses large-capacity architecture. The hardware system includes chassis, backplane, fan, power supply module, main control board, switching fabric and all sorts of line cards.

4.1.1.1 The architecture of ZXCTN 6500-8

1. The subrack structure

The instructions in subrack structure and the slots: ZXCTN 6500-8 subrack using longitudinal architecture splits into broadband line card area, interface card area, power supply board area and fan area.

Figure 4-1 ZXCTN 6500-8 subrack structure



The functions of the different components are:

1）The power supply board area: To install the power supply board.

2） The system interface board area: To install the system interface board.

3）The broadband line card/processing card area: To install all sorts of broadband line card /processing card

4）The main control board area: To install the main control switching fabric NCPSA.

5） The interface card area: To install all sorts of interface card.

6） Cabling area

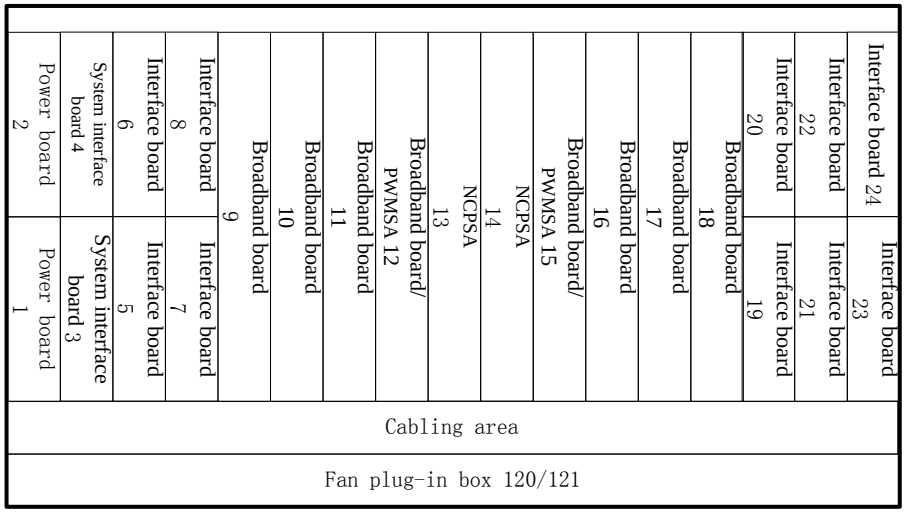
7） Fan area: To install fan chassis.

8） Dust-free net

2. Slot allocation

ZXCTN 6500-8 includes 8 full-height service card slots (broadband line card/proxy card), 5 full-height interface slots (or 10 half-height interface card slots), 2 main control board slots, 2 power supply board slots (half-height), 2 system interface card slots (half-height) and 1 fan slot.

Figure 4-2 ZXCTN 6500-8 slot allocation



4.1.1.2 Theoverall architecture of ZXCTN 6500-16

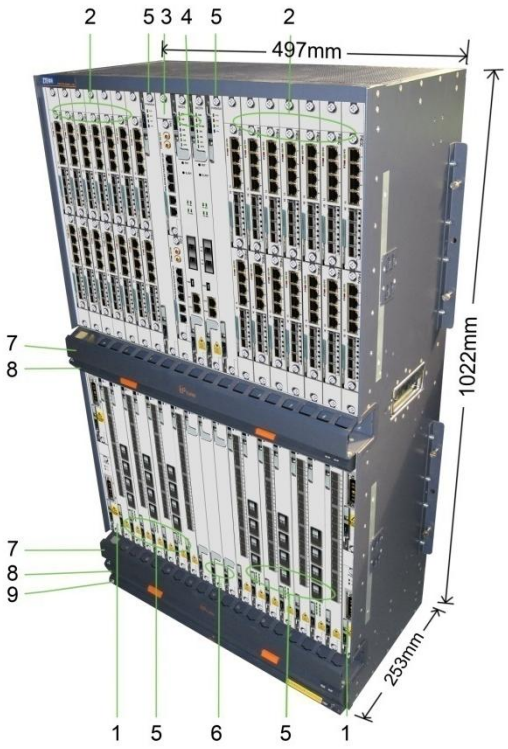
The hardware system of the ZXCTN 6500-16 is composed by the chassis, backplane, fan, power supply board, the main control board (NCPA) , all sorts of interface cards

and E1 protection board.

1. The subrack structure

The subrack structure of the ZXCTN 6500-16 is as shown in the 错误！未找到引用源。3

Figure 4-3 ZXCTN 6500-16 appearance



The functions of the different components are:

1）The power supply board area: To install the power supply board.

2） The system interface board area: To install the system interface board.

3）The system interface card area: To install the system interface card.

4）The main control board area: To install the main control board NCPSA.

5） The broadband line card/processing card area: To install all sorts of broadband line card/processing card.

6） Cabling area

7） Fan area: To install fan chassis.

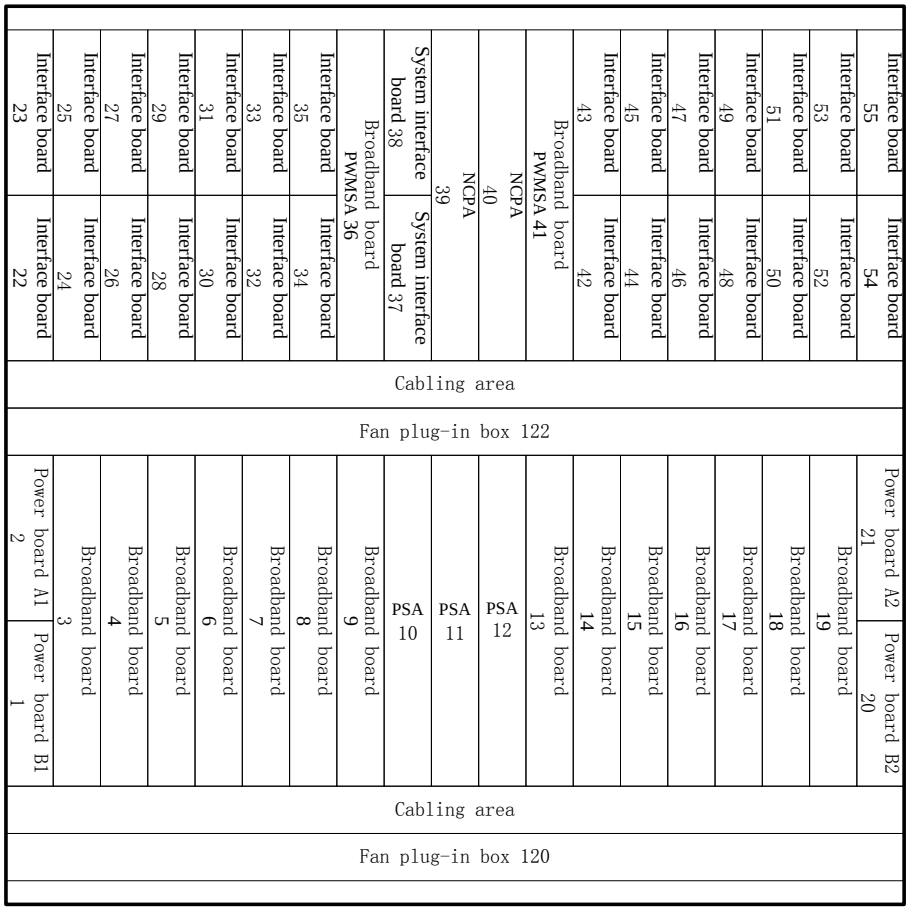
8） Dust-free net

2. Slot allocation

The ZXCTN 6500-16 includes 28 interface card slots (half-height), 2 main control board slots, 2 system interface card slots (half-height), 3 switching fabric slots, 16 broadband line card slots, 4 power supply board slots (half height) and 2 fan slots.

i. The allocation of the ZXCTN 6500-16 slot is as shown in 错误！未找到引用源。

Figure 4-4 ZXCTN 6500-16 slot allocation



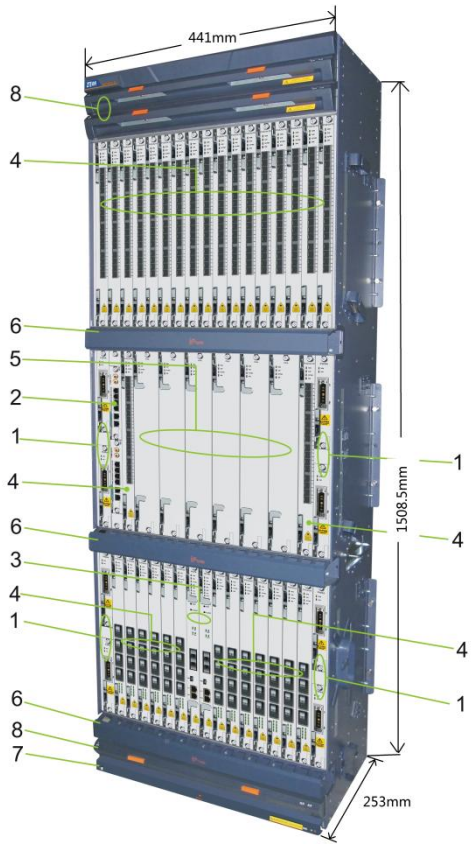
4.1.1.3 The overall architecture of ZXCTN 6500-32

The hardware system of the ZXCTN 6500-32 is composed by the chassis, backplane, fan, power supply board, main control board (NCPB) and all sorts of interface card.

1. The subrack structure

The subrack structure of the ZXCTN 6500-32 is as shown in the figure 4-5.

Figure 4-5 ZXCTN 6500-32 appearance



Feautres:

1）The power supply board area: To install the power supply board.

2） The system interface card area: To install the system interface card.

3） The main control board area: To install the main control board NCPSB

4） The broadband line card area: To install all sorts of broadband line card.

5）The switching fabric card area: To install the switching fabric

6） Cabling area

7） Fan area: To install fan chassis

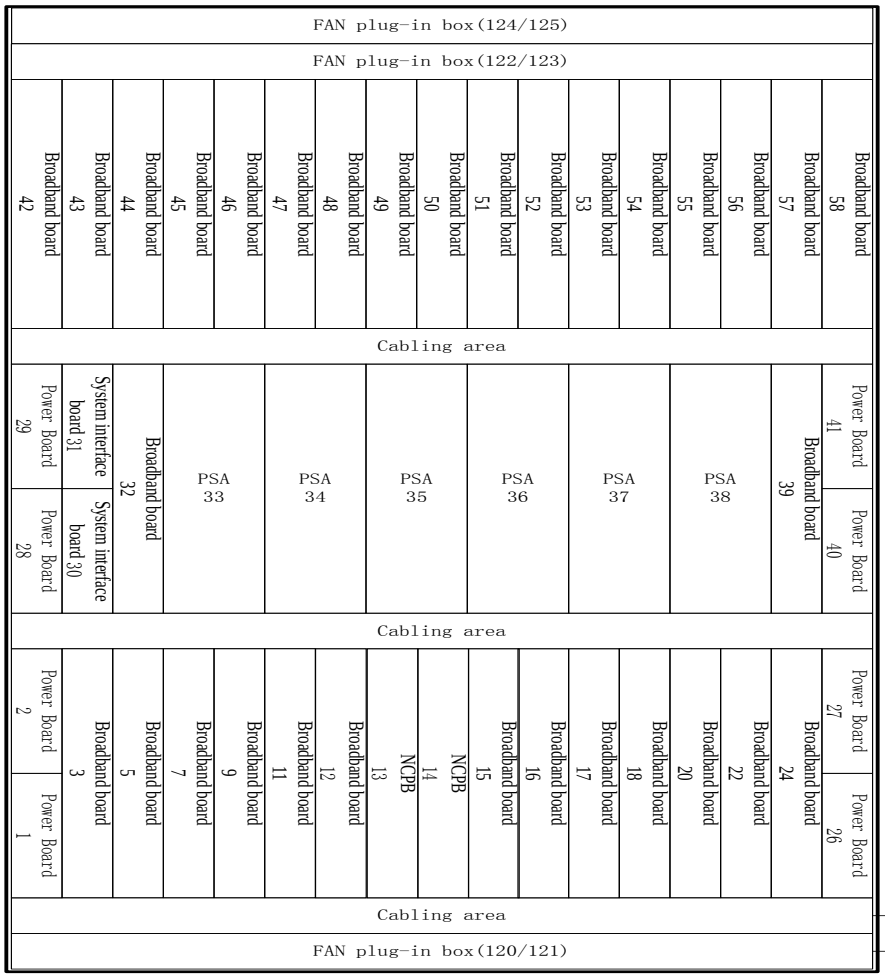
8） Fan area: To intall fan chassis.

2. Slot allocation

The ZXCTN 6500-32 includes 32 full height service card slots (broadband line card), 2 main control board slots, 2 system interface card slots (half-height), 6 switching fabric slots, 8 power supply board slots (half height) and 3 fan slots.

The allocation of the ZXCTN 6500-32 slots is as shown in the figure 4-6.

Figure 4-6 ZXCTN 6500-32 slot allocation



4.1.2 The working principle of the hareware system

TheZXCTN6500 system uses the distributed switching fabric which is totally independent from the services. All the services can be transferred to the switching fabric for unified scheduling and switching. In addition, the switching capacity of the switching fabric can be extended.

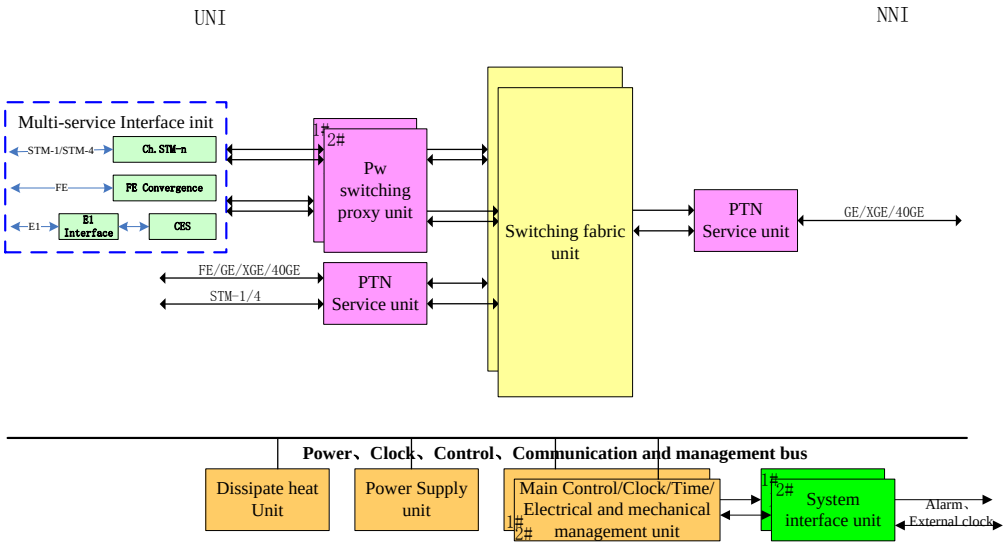
The backplane interface of the line card needs integrality and extensibility, so that it

can be compatible with all sorts of service card of different products. Besides, hybrid line cards can be installed in the same device to realize multi-service integration.

4.1.2.1 The working principle of the ZXCTN 6500

The ZXCTN 6500 hardware system includes the power supply unit, the main control unit, the system interface unit, the switching fabric unit, multi-service interface unit and PW switching proxy unit.The entire hardware system is in distributed architecture. The working principle of the ZXCTN 6500 hardware system is as shown in the figure 4-7.

Figure 4-7 ZXCTN 6500 hardware system working principle



The services of the major hardware units of the ZXCTN 6500 are:

1） The power supply unit: It provides -48V/-60V input electricity for all the modules on thr rack. Besides, it offers anti-surge, wave filtration, protection and the selection of the active and standby power supply services.

2） The cooling unit: It realizes the enforced cooling service of the system. It includes fan unit, fan alarm inspectionand control unit.

3） The system high-speed backplane unit: It realizes the connection of the control, clock, data and power supply signals among all the hardware functional units.

4） The main control unit: It provides the system with the services relating to the

management plane and the control plane. Physically, the Ethernet communications network between the system units transfers the management control information.

5） The system interface unit: It provides non-service user interface outward, i.e. system 2M external clock interface (BITS), system Qx interface (network management interface), GPS information interface (1PPS+TOD), external alarm input interface, external alarm output interface, subrack alarm input interface and the subrack alarm display interface.

6） The electrical and mechanical management unit: It realizes the power-on control, reset control, module manufacturing information query, operatinglog and temperature information query.

7） The clock/time synchronization unit: It provdes unified system clock and 1PPS signal for all the modules. It also realizes system 1588 time synchronization service.

8） The cell switching unit: It realizes service-free unified packet switching service to enable the data forwarding between different service line cards.

9）The PTN service unit: It realizes PTN-based service access and the adaption of the switching fabric.

10） The PW switching proxy unit: It aggregates the services of different low-speed multi-service interce and realizes the switching fabric adaption.

11）The multi-service interface unit: It accesses the services (e.g. TDM and Ethernet) of the different low-speed service interface.

4.2 Hardware module instruction

4.2.1 ZXCTN 6500 Hardware Module

4.2.1.1 Module Overveiw

The ZXCTN 6500 module includes public module, service processing module and interface module.

Table 4-1 ZXCTN 6500 Module

Module Type	Module Code	Module Name	Meaning
Public module	PSA	A-type switching fabric	Packet Switch Board,type A
	PSB	B type switching fabric	Packet Switch Board type B
	NCPA	A-type main control board	Net Control Process Board，type A
	NCPB	B type main control board	Net Control Process Board, type B
	NCPSA	A type main control switching	Net Control Process and Packet Switch Board, type A
	SAIA	A-type system interface board	System Auxiliary Interface,type A
	SAIB	B type system interface board	System Auxiliary Interface, type B
	PWRA	A-type power supply board	Power Board, type A
	PWRB	B type power supply board	Power Board, type B
Service processing module	PWMSA	A-type switching proxy board	PW Multi-Service Switch Agent Line Card,type A
	PXLGA	A-type 1-port 40GE line card	1-port 40GE Line Card, type A
	PXGAx4	A-type 4-port XGE board	4 port XGE line Card,type A
	PXGAx2	A-type 2-port XGE line card	2-port XGE Line Card, type A
	PGEAx16	A-type 16-port GE line card	16 port GE line Card,type A
	PGEAx8	A-type 8-port GE line card	8-port GE line card type A
	PS1Cx4	Channelized / CEP STM-1x4 Board	4 ports STM-1 Channelized / CEP Board
Interface	R63E1U	63-port E1 board	63 port E1 board Unit board

Module Type	Module Code	Module Name	Meaning
board	RE1PI-75	E1 switchover board -75	63 port E1 board with Protective Interface,75 ohm
	RE1PI-120	E1 switchover board -120	63 port E1 board with Protective Interface, 120 ohm
	R8HGE	8-port high performance Gigabit electrical interface card	8-port High level Gigabit Ethernet ELE interface
	R8HGF	8-port high performance Gigabit optical interface card	8-port High level Gigabit Ethernet Fiber interface
	R8FEF	8-port 100M optical interface board	8 port Fast Ethernet Fiber Interface
	R8FEI	8-port 100M electrical interface board	8 port Fast Ethernet ELE Interface
	R4CEP	4-port STM-1 CEP card	4-port STM-1 Cirtuit Emulation over Packet board
	R4CSB	4xSTM-1/1xSTM-4 channelized STM-1 board	4xSTM-1/1xSTM-4 Channelized STM-1 Board

4.2.1.2 Slots occupied by the module

The ZXCTN 6500 includes the public module, service processing module and interface board.

Table 4-2 The availe slot on the ZXCTN 6500-16 module

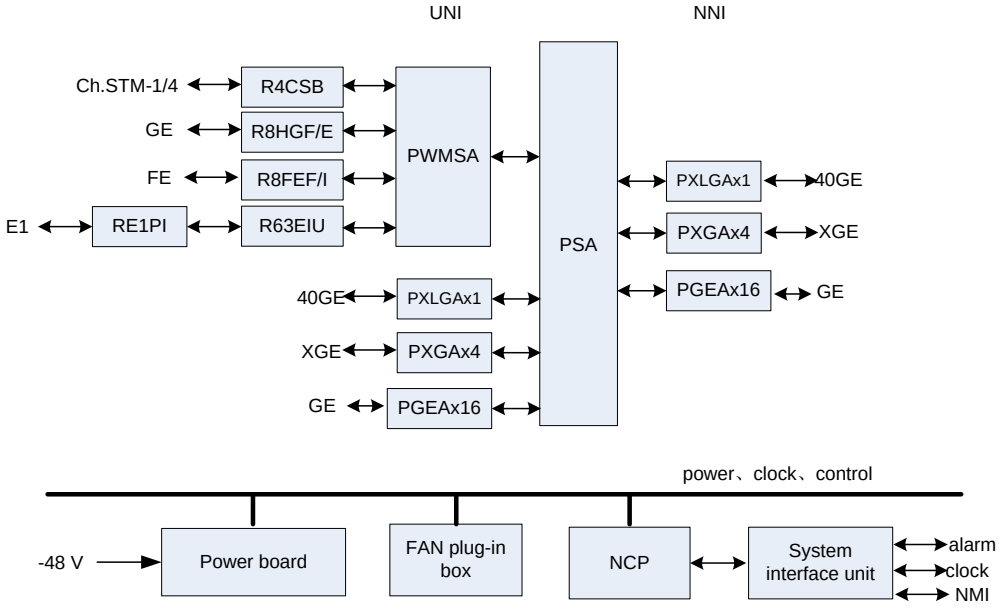
Module Type	Module Code	Slot Quanitty
Public module	PSA	Private slot

Module Type	Module Code	Slot Quanitty
	PSB	Private slot
	NCPA	Private slot
	NCPB	Private slot
	NCPSA	Private slot
	SAIA	Private slot
	PWRA	Private slot
	PWRB	Private slot
Service processing module	PWMSA	1 full-height slot
	PXLGA	1 full-height slot
	PXGAx4	1 full-height slot
	PXGAx2	1 full-height slot
	PGEAx16	1 full-height slot
	PGEAx8	1 full-height slot
	PS1Cx4	1 full-height slot
Interface board	R63E1U	1 half-height slot
	RE1PI-75	1 full-height slot
	RE1PI-120	1 full-height slot
	R8HGE	1 half-height slot
	R8HGF	1 half-height slot
	R8FEF	1 half-height slot
	R8FEI	1 half-height slot
	R4CEP	1 half-height slot
	R4CSB	1 half-height slot

4.2.1.3 The relationship between different modules

Different modules of the ZXCTN 6500 work together with each other to privde different system services. The relationships of the different modules are as shown in the figure.

Figure 4-8 The relationships of the different modules of the ZXCTN 6500

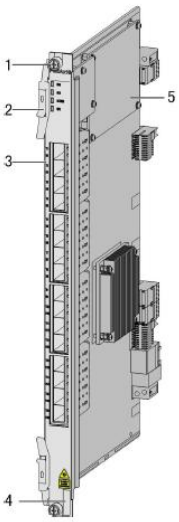


4.2.1.4 The module appearance

The ZXCTN 6500 provides two sorts of module, i.e. full height and half height.

The size of the full-height module is 25.0mm (W) x 395.4mm (H) x 210.0 mm (PCB D). Take PGEAx16 board as an example, its appearance is as shown in the figure.

Figure 4-9 Full-height module structure

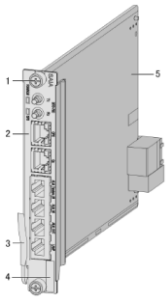


1. Captive screw 2.Wrench 3.Panel

4. The location of the module barcode 5.PCB

The size of the half-height module is : 25.0mm(W) x158.2mm (H) x210.0mm (PCB D).

Figure 4-10 Half-height module structure



1. Captive screw 2.Wrench 3.Panel

4. The location of the module barcode 5.PCB

4.2.1.5 Introduction to Cards

Switching Card A - PSA

PSA card uses unified packet switching architecture which is unrelated to services. It implements system service scheduling, and crossing. The description of card functions is shown in table:

Table 4-3 Description of PSA card functions

Function	Description
Switching capacity	960Gbit/s
Protection	It supports card protection. System PSA cards implement load balancing. When one card fails, plug it out and the switching capacity of the whole system will not be influenced. ZXCTN 6500-8 switching function is integrated on the main control card, supporting 1+1 protection. ZXCTN 6500-16 supports 2+1 protection.
Card hot swapping	Support
Card temperature check	Support
Card software remote upgrade	Support

Figure 4-11 PSA panel

1. Indicator

B-type switching fabric PSB

PSB card uses integrated packet swtiching fabric irrelevant with services to implement system service scheduling and crossing. The card functions are described in the table:

Table 4-4 Description of PSB card functions

Function	Description
Switching capacity	960Gbit/s
Protection	It supports card protection. System PSB cards implement load balancing. When one card fails, plug it out and the switching capacity of the whole system will not be influenced. ZXCTN 6500-32 supports 4+2 protection.
Card hot swapping	Support
Card temperature check	Support
Card software remote upgrade	Support

Figure 4-12 PSB panel

1. indicator

Main control card A - NCPA

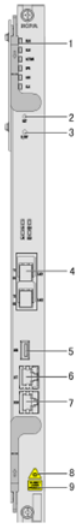
NCPA card implements network element managemetn, control plane and clock synchronization. The card functions are shown in Table 4-4:

Table 4-5 Description of NCPA card functions

Item	Description
Interface	2 subrack communication interconnecting interfaces 1 USB interface 1 LCT interface 1 commissioning interface
Network element management	Receive and process network management command Manage and collect alarm and performance message of each card, and report them to the network management system. Run network protocol Implement control over electromechanical unit of each card on the subrack. Provide subrack cascading. Provide large-capacity storage space, save timeslot configuration, performance alarm, historical events, clock configuration, security management data, and card software program.
Control plane	Support GMPLS-based control plane

Item	Description
Clock synchronization	Support network clock frequency synchronization Support clock frequency recovery from 1PPS interface. Support clock frequency recovery by IEEE 1588V2 packet to implement clock extraction. Supporrt SSM processing.
Protection	Support 1+1 hot standby protection
Card hot swapping	Support
Card temperature check	Support
Card software remote upgrade	Support

Figure 4-13 NCPA panel



1.Indicator 2.Reset 3.Ring trip reset 4.Subrack communication interconnecting interface 5.USB interface 6.Local maintenance terminal interface 7.Commissioning interface 8.Laser warning sign 9. Laser level sign

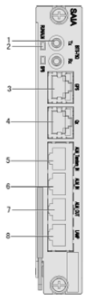
System interface card A - SAIA

SAIA card provides non-service type system interface. The functions it supports are shown in Table 4-5:

Table 4-6 Description of SAIA card system interface

Interface	Ports that the card supports	Maximal ports that the system supports	Description
BITS clock output interface	1	2	Clock type 2MHz or 2Mbit/s can be set by network management
BITS clock input interface	1	2	Clock type 2MHz or 2Mbit/s can be set by network management
Time synchronization interface (1PPS+TOD)	1	2	Input or output interface can be set by network management
Network management interface	1	2	10M/100M/1000M Ethernet electrical interface, supporting 1+1 protection
Alarm cascading input interface	4	8	Switch signal. 4-port alarm cascading input signal share one physical interface
External alarm input interface	4	8	Switch signal. 4-port alarm cascading input signal share one physical interface
Alarm output interface	4	8	Switch signal. Providing minor, major, and critical alarm and ring signal output for array cabinet display. 4-port alarm output signal share one physical interface.
Subrack alarm display interface	5	10	TTL electrical level alarm signal, providing warning, minor, major alarm and ring information output for cabinet alarm box or cabinet indicator. 5-port alarm signal share one physical interface TTL.

Figure 4-14 SAIA panel



1.BITS clock interface 2Indicator 3.Time synchronization interface 4.Network amangement interface 5.Alarm cascading input interface 6.External alarm input interface 7.Alarm output interface 8.Subrack alarm dispaly interface

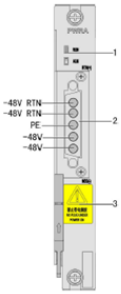
Power supply card A – PWRA/Power supply card B - PWRB

PWRA/PWRB card processing takes input of -48V/-60V DC power supply, output of -48V/-60V DC secondary power supply, and provides power supply for subrack card by back plane. The functions it supports are shown in Table 4-6:

Table 4-7 Description of PWRA/PWRB card functions

Function	Description
Protection	Support 1+1 hot standby protection
Over-voltage/under-voltage check	When external power supply voltage is too low, the card reports under-voltage alarm. When external power supply voltage is too high, the card reports over-voltage alarm.
Anti-reverse connection at input end of power supply	Support. PWRA card doesn’t work when its input line polarity is connected reversely. It can work normally when its polarity recovers.
Over-current protection	Support
Card temperature check	Support
Card power check	Support

Figure 4-15 PWRA/PWRB panel



1.Indicator 2.Power supply socket 3.warning sign

Switching proxy line card A - PWMSA

PWMSA card implements service aggregation after low-speed interface card processing such as E1, STM-1/STM-4, and FE service aggregation. It is used by ZXTN 6500-16. Description of card functions are shown in Table 4-7:

Table 4-8 Description of PWMSA card functions

Function	Description
Service processing capacity	It can aggregate services of 24 low-speed interface cards
Protection	Support 1:1 hot standby protection
OAM	Support
QoS	Support hierarchical QoS
E1 branch protection switching processing and control	Support
Card hot swapping	Support
Card software remote upgrade	Support

Figure 4-16 PWMSA panel

1. Indicator

Type A 1-port 40GE line card PXLGA

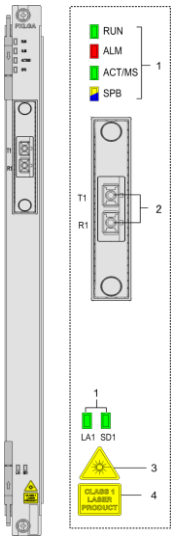
PXLGA implements 1-port 40GE Ethernet data processing. The functions that the card supports are shown in the table:

Table 4-9 Description of PXLGA functions

Function	Description
Interface	1-port 40GE LAN optical interface
Clock	It supports implementation of time and frequency synchronization based on IEEE 1588V2, 1 PPS, or SynE. It supports SynE processing.
Ethernet MAC	It supports Ethernet frame encapsulation and de-encapsulation, abnormal frame check, JUMBO frame processing and traffic control. It supports the minimal frame length of 64 bytes. It supports Ethernet performance query including normal performance and incorrect performance query. Accumulated port traffic statistics is implemented by classifying the traffic based on packet, byte, unicast, multicast, broadcast or packet length. The port supports display of information including connection status, working rate mode, port statistics and current ingress/egress bandwidth. It supports Ethernet link aggregation processing.

Function	Description
OAM	It supports quick/slow OAM packet processing of Ethernet and MPLS-TP. It supports service protection processing based on quick OAM or link.
QoS	It supports level-5 QoS scheduling of services.
Optical interface analog check	Support
Card temperature check	Support

Figure 4-17 PXLGA panel



1. Indicator 2. Optical interface 3. Laser warning sign 4. Laser level sign

Type A 4-port XGE line card - PXGAx4

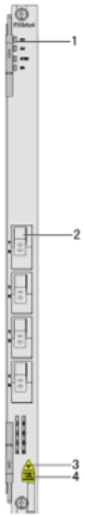
PXGAx4 card implements 4-port 10GE Ethernet data processing. The functions it supports are shown in Table 4-8:

Table 4-10 Description of PXGAx4 card functions

Function	Description
Interface	4 10GE LAN/WAN optical interfaces
Clock	Support line clock extraction of any 2-port signal. Support synchronous Ethernet clock source setting at any 2 interfaces.

Function	Description
	Support IEEE 1588v2 related functions.
10GE EthernetMAC	Support Ethernet performance query Support accumulated traffic statistics at port based on packet and byte. Support port display of information such as connection status and working rate mode Support bandwidth information prot statistics of ingress and egress
OAM	Support
QoS	Support hierarchical QoS
Optical interface simulation check	Support
Card hot swapping	Support
Card temperature check	Support
Card software remote upgrade	Support

Figure 4-18 PXGAx4 panel



1. Indicator 2.Optical interface 3.Laser warning sign 4.Laser level sign

Type A 16-port GE Card A - PGEAx16

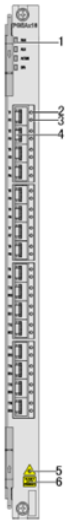
PGEAx16 card implements 16-port GE and FE service processing, as well as two semi-height GE optical interface card service processing. Among them each

semi-height GE optical interface card supports up to 8-port GE service access. The functions that the card supports are shown in Table 4-11:

Table 4-11 Description of PGEAx16 card functions

Function	Description
Interface	Provide 16 GE/FE interfaces The interface can be configured as GE optical interface or electrical interface
Clock	Support synchronous Ethernet clock source setting at any 2 interfaces. Support IEEE 1588v2 related functions
OAM	Support
QoS	Support hierarchical QoS
Card hot swapping	Support
Card temperature check	Support
Card software remote upgrade	Support

Figure 4-19 PGEAx16 panel



1. Card indicator 2.Optical interface connection status indicator 3.Optical interface signal status indicator

4.Optical interface 5.Laser warning sign 6.Laser level sign

63-port E1 unit card R63E1U

R63E1U card implements access and processing of TDM E1 at UNI side. The functions it supports are shown in Table 4-10:

Table 4-12 Description of R63E1U card functions

Function	Description
Service processing capabitliy	Support 63-port E1 service processing. Support 75ohm and 120ohm E1 interfaces. Physical interface is provided by RE1PI card.
Clock	Support differentiated clock recovery and self-adaptive clock recovery Support 8-port E1 retiming Support the former 4-port E1 clock extraction
TDM	Support circuit emulation of UDT and SDT
Protection	Implement TPS protection with RE1PI card

Figure 4-20 R63E1U panel

1. Indicator

80-port 100M optical/electrical card R8FEF/R8FEI

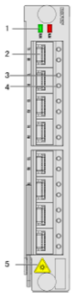
R8FEF/R8FEI card implements 8-port FE service processing. The functions it supports are shown in Table 4-11:

Table 4-13 Description of R8FEF/R8FEI card functions

Function		Description
Interface	R8FEF card	It provides 8 100M SFP optical interface The optical interface supports 100Base-FX It supports optical interface rate configuration It supports optical interface digital diagnosis

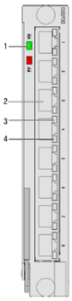
Function		Description
	R8FEI card	It provides 8 100M electrical interface The electrical interface type supports 10Base-T and 100Base-TX It supports electrical interface 10M/100M automatic negotiation It supports electrical interface compulsory mode It supports electrical automatic crossing in any mode It supports electrical interface cable test.
Clock		Supports synchronous Ethernet Supports time stamp of IEEE 1588v2 packet
OAM		Help fulfil system OAM related LM and DM functions Support MEL value alteration in MPLS-TP OAM packet.
Laser shutdown		R8FEF card optical interface supports automatic laser shutdown
Card software remote upgrade		Support

Figure 4-21 R8FEF panel



1.Indicator 2.FE optical interface 3.Optical interface ACTIVE status indicator 4.Optical interface LINK status indicator 5.Laser warning sign

Figure 4-22 R8FEI panel



1. Indicator 2.FE electrical interface 3.Electrical interface ACTIVE status indicator 4. Electrical interface LINK status indicator

4xSTM-1/1xSTM-4 channelized STM-N card R4CSB

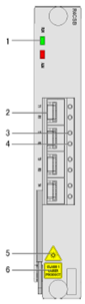
R4CSB card implements 4-port channelized STM-1 or 1-port channelized STM-4 service processing. It implements structurized and non-structurized TDM service aggregation and transparent transmission. The functions it supports are shown in the following figure:

Table 4-14 Description of R4CSB card functions

Function	Description
Interface	Provide 4-port STM-1 or 1-port STM-4 aggregation port. Support 252-port E1 service mapping to SDH
SDH	Support standard SDN frame structure, SDH edge, clock recovery, section layer cost processing, and alarm performance statistics. Support 1+1 and 1:1 linear multiplexing segment protection at STM-1 side.

Function	Description
Clock	Extract the clock of a STM-1 interface as the reference clock and transport it to the main control card as the system clock. Support differentiated clock recovery and self-adaptive clock recovery.
Packet	Support PWE3 service encapsulation bearing Support structurized TDM service and non-structurized TDM service
Laser shutdown	Support
Card hot swapping	Support
Card software remote upgrade	Upgradable

Figure 4-23 R4CSB panel



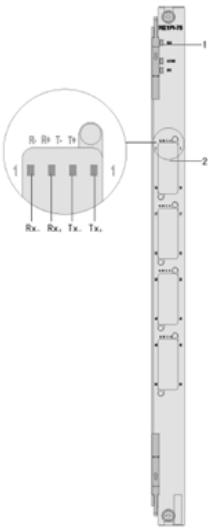
1.Indicator 2.Optical interface 3.Input optical interface indicator 4.Output optical interface indicator 5.Laser warning sign 6.Laser level sign

E1 switching card RE1PI-75/RE1PI-120

RE1PI-75/RE1PI-120 card provides R63E1U card with E1 interface. The functions it supports are as follows:

- Provide 63-port E1 interfaces
- Accept the switching commands of PW switching proxy line card, and implement line switching.
- Communicate with the main control card and transmit data information

Figure 4-24 RE1PI-75 panel

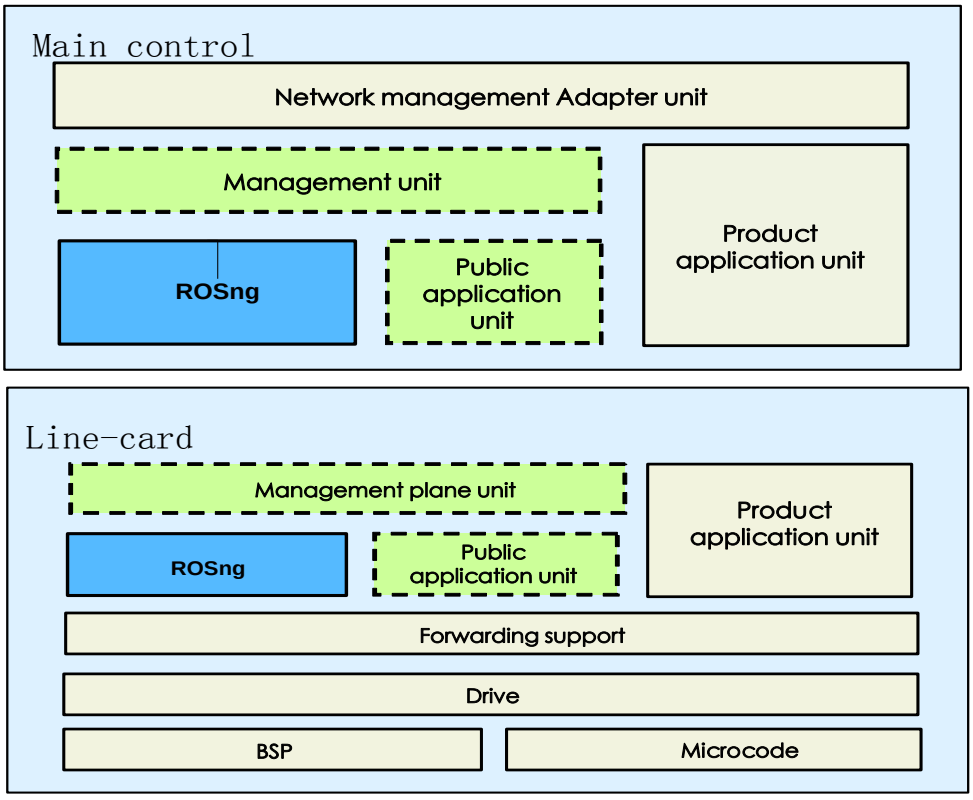


1.Indicator 2.E1 electrical interface

4.3 Software Structure

Overall software logic diagram of ZXCTN 6500 is shown in Figure 4-23

Figure 4-25 Software structure



Product Management unit: includes product resource management, software deployment, power-on initiation, main/secondary switching, data synchronization, DCN, and inter-card communication.

Management plane unit: implements network management interfaces of different types including adaption of Qx, CLI, SNMP, and TL1. Each card is deployed covering configuration, alarm performance, security and log units.

Service management unit: provides service tree calculation, H-QoS/QoS and queue calculation, and ACL control.

Main control support: chip configuration at main control card.

Drive: it provides software drive for main control, line card back plane, fan and power supply.

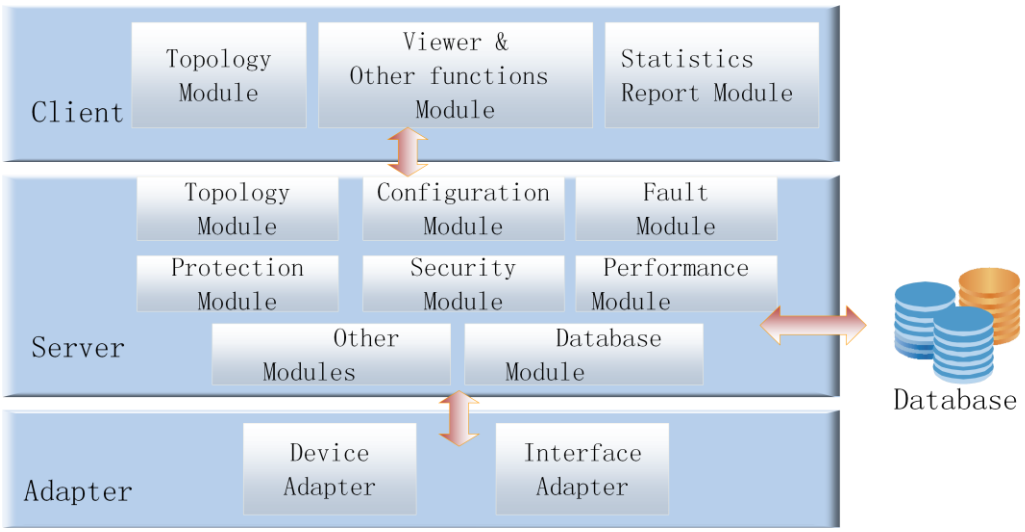
Protocol stack platform: includes VPN/L2 service, PW/LSP control signaling and routing.

Forwarding support: It's responsible for configuration of forwarding chips.

4.3.1 Network Management Software

ZXCTN 6500 uses NetNumen U31 to implement the unified management and monitoring of the network elements. It has functions of configuration management, failure management, performance management, maintenance management, E2E circuit management, security management, system management and report management.

Figure 4-26 Network management software composition



Server

The server implements the following functions:

1） Receive the request from user interface. Analyze it and send the message to Agent, or send it to the database.

2） Receive the message processed by the database. Analyze it, and send it to the user interface.

3） Receive the message from Agent. Analyze it, and send it to the database or user interface.

Client

The client has the following functions:

1) Provide user graphic interface.

4） Provide the service interface of configuraiotn management, failure management, performance management, security management, security management, maintenance management, system management, and help system.

5） Implements user security control.

Database

The database mainly implements storage of information query, configuration and alarm, and data consistency of interface and management units.

4.3.2 Communication Protocols and Interfaces

The interfaces used and the corresponding communication protocols in ZXCTN 6500 software system are shown in Table:

Table 4-15 Description of software system interface

Interface name	Description of interface
S interface	Agent on the network element control card and communication interface on other cards use HDLC bus to communicate.
Qx interface	The interface of Agent and Manager are the interfaces at the host where the program connecting network element control card with network management server locates. On ZXCTN 6500, the interface locates at the system interface card, following TCP/IP protocol, ITU-T Q.811 and ITU-T Q.812 proposals.
F interface	The interface connecting Agent and LCT. F interface uses Ethernet, following TCP/IP protocol.
ECC interface	Communication interface between the network elements, following TCP/IP protocol.

ZXCTN 6500 supports the following protocols standards:

– L2 protocol and standard:

L2 protocol and standard	
IEEE 802.1d Bridging	IEEE802.1x Port Based Network Access
EEE 802.1s Multple Spanning Tree	IEEE 802.3ad Link Aggregation
IEEE 802.1w Rapid Spanning Tree	IEEE 802.3ag Service Layer OAM
IEEE 802.1Q VLAN tagging	IEEE 802.3ah Provider Backbone B
9216 bytes jumbo frame forward on ethernet and pos interface	IEEE 802.1ab LLDP(Link Layer Discovery Protocol)
IEEE 802.1ad VLAN stacking, Select QinQ, VLAN translate	IGMP v1/v2 snooping/proxy
IEEE 802.3 10BaseT	IEEE 802.3ae 10Gpbs Ethernet
IEEE802.3ah Ethernet OAM	IEEE 802.3x Flow Control
IEEE 802.3 100BaseT	IEEE 802.3z 1000BaseSX/LX

L2 protocol and standard	
IEEE 802.3u 100BaseTx	IEEE 802.3ae 10Gbps Ethernet
ESRP Ethernet smart Ring Protoco	ZESS ZTE Ethernet smart switch
IEEE 802.1p VLAN Priority	

– TCP/IP protocol and standard:

TCP protocol and standard	
RFC 768 UDP	RFC 791 IP
RFC 792 ICMP	RFC 793 TCP
RFC 826 ARP	RFC 854 Telnet
RFC 951 BootP	RFC 1350 TFTP
RFC 1519 CIDR	RFC 1812 Requirements for IPv4 Routers
RFC 2328 TFTP Blocksize Option	RFC 2347 TFTP option Extension
RFC2349TFTPTimeoutIntervaland TransferSize option	RFC 2401 Security Architecture for Internet Protocol
draft-ietf-bfd-mib-00.txt Bidirectional Forwarding Detection Management Information Base	draft-ietf-bfd-base-02.txt Bidirectional Forwarding Detection
draft-ietf-bfd-v4v6-1hop-02.txt BFD IPv4 and IPv6(Single Hop)	

– RIP protocol and standard:

RIP protocol and standard	
RFC 1058 RIP Version1	RFC 2453 RIP Version2
RFC 2082 RIP-2 MD5 Authentication	

– OSPF protocol and standard

OSPF protocol and standard	
RFC 1765 OSPF Database Overflow	RFC 2328 OSPF Version 2
RFC 2370 Opaque LSA Support	RFC 2740 OSPF for IPv6(OSPFv3)
RFC 3101 OSPF NSSA Option	RFC 3137 OSPF Stub Router Advertisement
RFC 3623 Graceful OSPF Restart–GR helper	

– BGP protocol and standard:

BGP protocol and standard	
RFC 1397 BGP Default Route Advertisement	RFC 1772 Application of BGP in the Inernet
RFC 1965 Confederations for BGP	RFC 1997 BGP Attribute Communities
RFC 2385 Protection of BGP Sessions via MD5	RFC 2439 BGP Route-Flap Dampening
RFC 2547bis BGP/MPLS VPNs	RFC 2796 BGP Route Reflection
draft-ietf-idr-rfc2796bis-02.txt	draft-ietf-idr-rfc2858bis-09.txt
RFC 2918 Route Refresh Capabil-ity for BGP4	RFC 3065 Confederations for BGP
draft-ietf-idr-rfc3065bis-05.txt	RFC 3392 Capabilities Advertise-ment with BGP4
RFC 4271 BGP-4 (previously RFC 1771)	RFC 4360 BGP Extended Communities Attribute
RFC 4364 BGP/MPLS IP Virtual Private Networks (VPNs)	RFC 2547bis BGP/MPLS VPNs
RFC 4724 Graceful Restart Mechanism for BGP–GR helper	RFC 4760 Multi-protocol Extensions for BGP
RFC 4203 for Shared Risk Link Group (SRLG) sub-TLV	

– ISIS standard

ISIS standard	
RFC 1142 OSI IS-IS Intra-domain Routing Protocol (ISO 10589)	RFC 1195 Use of OSI IS-IS for routing in TCP/IP&dual environments
RFC 2763 Dynamic Hostname Exchange for IS-IS	RFC 2973 IS-IS Mesh Groups
RFC 3373 Three-Way Handshake for Intermediate System to Inter-mediate System (IS-IS) Point-to-Point Adjacencies	RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
RFC 3567 Intermediate System to Intermediate System(IS-IS)	Cryptographic Authentication
RFC 3719 ecommendations for Interoperable Networks using IS-IS	RFC 3784 Intermediate System to Intermediate
System(IS-IS) Extensions for Traffic	RFC 3787 Recommendations for

ISIS standard	
Engineering (TE)	Interoperable IP Networks
RFC 3847 Restart Signaling for IS-IS–GR helper	RFC 4205 for Shared Risk Link Group (SRLG) TLV
draft-ietf-isis-igp-p2p-over-lan-05.txt	

– VRRP standard:

VRRP standard	
RFC 2787 Definitions of Managed Objects for the Virtual Router Redundancy Protocol	RFC 3768 Virtual Router Redundancy Protocol

– LDP standard:

LDP standard	
RFC 3036 LDP Specification	draft-jork-ldp-igp-sync-03
RFC 3037 LDP Applicability	RFC 3478 Graceful Restart Mechanism for LDP–GR helper

– IPV6 standard

IPV6 standard	
RFC 1981 Path MTU Discovery for IPv6	RFC 2375 IPv6 Multicast Address Assignments
RFC 2460 Internet Protocol Version 6(IPv6) Specification	RFC 2461 Neighbor Discovery for IPv6
RFC 2462 IPv6 Stateless Address Auto configuration	RFC 2463 Internet Control Message Protocol(ICMPv6) for the Internet Protocol Version 6 Specification
RFC 2464 Transmission of IPv6 Packets over Ethernet Networks	RFC 2529 Transmission of IPv6 over IPv4 Domains without Explicit Tunnels
RFC 2545 Use of BGP-4 Multi-protocol Extension for IPv6 Inter-Domain Routing	RFC 2710 Multicast Listener Discovery (MLD) for IPv6
RFC 2740 OSPF for IPv6	RFC 3306 Unicast-Prefix-based IPv6 Multicast Addresses
RFC 3315 Dynamic Host Configu-ration Protocol for IPv6	RFC 3587 IPv6 Global Unicast Address Format
RFC 3590 SourceAddress Selection	RFC 3810 Multicast Listener Discovery

IPV6 standard	
for the Multicast Listener Discovery (MLD) Protocol	Version 2 (MLDv2) for IPv6
RFC 4007 IPv6 Scoped Address Architecture	RFC 4193 Unique Local IPv6 Unicast Addresses
RFC 4291 IPv6 Addressing Architecture	RFC 4659 BGP-MPLS IP Virtual Private Network(VPN) Extension for IPv6 VPN
RFC 5072 IP Version 6 over PPP	

– Multicast standard:

Multicast standard	
RFC 1112 Host Extensions for IP Multicasting(Snooping)	RFC 2236 Internet Group Man-agement Protocol
RFC 2362 Protocol Independent Multicast-Sparse Mode(PIM-SM)	RFC 3376Internet Group Management Protocol Version3
RFC 3446 Anycast Rendevous Point(RP) mechanism using Protocol Independent Multicast(PIM) and Multicast Source Discovery Protocol(MSDP)	RFC 3618 Multicast Source Discovery Protocol (MSDP)
RFC 4601 Protocol Independent Multicast-Sparse Mode(PIM-SM)	RFC 4604 Using IGMPv3 and MLDv2 forSource-Specific Multicast
RFC 4607 Source-Specific Multicast for IP	RFC 4608 Source-Specific Protocol Independent Multicast in 232/8
RFC 4610 Anycast-RP Using Protocol Independent Multicast(PIM)	draft-ietf-pim-sm-bsr-06.txt
draft-rosen-vpn-mcast-08.txt	draft-ietf-mboned-msdp-mib-01.txt

– MPLS standard:

MPLS standard	
RFC 3031 MPLS Architecture	RFC 3032 MPLS Label Stack
RFC 4182 Removing a Restriction on the use of MPLS Explicit NULL	RFC 4379 Detecting Multi-Proto-col Label Switched (MPLS) Data Plane Failures

– RSVP-TE standard:

RSVP-TE standard

RSVP-TE standard	
RFC 2430 A Provider Architecture DiffServ&TE	RFC 3209 Extensions to RSVP for Tunnels
RFC 2747 RSVP Cryptographic Authentication	RFC 3097 RSVP Cryptographic Authentication
RFC 2702 Requirements for Traffic Engineering over MPLS	RFC 4090 Fast reroute Extensions to RSVP-TE for LSP Tunnels

– Differentiated Services standard:

Differentiated Services standard	
RFC 2474 Definition of the DS Field the IPv4 and IPv6 Headers(Rev)	RFC 2598 An Expedited Forwarding PHB
RFC 2597 Assured Forwarding PHB Group (rev3260)	RFC 3140 Per-Hop Behavior Identification Codes

– PPP standard:

PPP standard	
RFC 1332 PPP IPCP	RFC 1377 PPP OSINLCP
RFC 1662 PPP in HDLC-like Framing	RFC 1638/2878 PPP BCP
RFC 1661 PPP	RFC 1989 PPP Link Quality Monitoring
RFC 1990 The PPP Multilink Protocol(MP)	RFC 2516 A Method for Transmitting PPP Over Ethernet
RFC 2615 PPP over SONET/SDH	

– ATM standard:

ATM standard	
RFC 2514 Definitions of Textual Conventions and OBJECT_IDENTI-TIES for ATM Management	RFC 2515 Definition of Managed Objects for ATM Management
ITU-T Recommendation I.610– B-ISDN Operation and Maintenance PrincIPles and Functions version 11/95	ITU-T Recommendation I.432.1–BISDN user-network interface–Physical layer specification:General characteristics
GR-1248-CORE-Generic Require-ments for Operations of ATM Network Elements(NEs)，Issue 3	AF-TM-0121.000 Traffic Manage-ment Specification Version 4.1
RFC 1626 Default IP MTU for use over	RFC2684 MultIProtocol

ATM standard	
ATM AAL5	Encapsulation over ATM Adaptation Layer 5
GR-1113-CORE-Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer(AAL) Protocols Generic equirements,Issue1	AF-ILMI-0065.000 Integrated Local Management Interface(ILMI) Version4.0
AF-TM-0150.00 Addendum toTraffic Management v4.1 optional minimum desired cell rate indication for UBR	

– DHCP standard:

DHCP standard	
RFC 2131 DynamicHost-Configuration Protocol(REV)	RFC 3046DHCP Relay Agent Information Option(Option 82)

– VPLS standard:

VPLS standard	
RFC 4762 Virtual Private LAN Services Using LDP(previously draft-ietf-l2vpn-vpls-ldp-08.txt)	draft-ietf-l2vpn-vpls-mcast-reqts-04.txt

– PWE3 standard:

PW standard	
RFC 3985 Pseudo Wire Emulation Edge-to-Edge(PWE3)	RFC 4385 Pseudo Wire Emulation Edge-to-Edge(PWE3) Control Word for Use over an MPLS PSN
RFC 3916 Requirements for PWE3	RFC 4446 IANA Allocations for PWE3
RFC 4447 PseudowireSetup and Maintenance Using LDP(draft-ietf-pwe3-control-protocol-17.txt)	RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks(draft-ietf-pwe3-ethernet-encap-11.txt)
RFC 4619 Encapsulation Methods for Transport of Frame Relay over MPLS Networks(draft-ietf-pwe3-frame-relay-07.txt)	RFC 4717 Encapsulation Methods for Transport ATM over MPLS Networks (draft-ietf-pwe3-atm-encap-10.txt)
RFC 4816 PWE3 ATM Transparent Cell Transport	RFC 5085,Pseudowire Virtual Circuit Connectivity Verification (VCCV):A

PW standard	
Service(draft-ietf-pwe3-cell-transport-04.txt)	Control Channel for Pseudowires
draft-ietf-l2vpn-vpws-iw-oam-02.txt	draft-ietf-pwe3-oam-msg-map-05-txt
draft-ietf-l2vpn-arp-mediation-04.txt	draft-ietf-pwe3-ms-pw-arch-02.txt
draft-ietf-pwe3-segme nted-pw-05.txt	draft-hart-pwe3-segmented-pw-vccv-02.txt
draft-muley-dutta-pwe3-redundancy-bit-02.txt	draft-muley-pwe3-redundancy-02.txt
MFA Forum 9.0.0 The Use of Virtual trunks for ATM/MPLS Control Plane Interworking	MFA Forum 12.0.0 Multiservice Interworking–Ethernet over MPLS
MFA Forum 13.0.0–Fault Management for Multiservice Interworking v1.0	MFA Forum 16.0.0–Multiservice Interworking–IP over MPLS

– Network management standard:

Network management standard	
ITU-T M.3000, Overview of TMN recommendations	ITU-T M.3010, PrincIPles for a Telecommunications management network
ITU-T M.3016, TMN security overview	ITU-T M.3020, TMN Interface Specification Methodology
ITU-T M.3100 Generic Network Information Model	ITU-T M.3101, Managed Object Conformance Statements for the Generic Network Information Model
ITU-T M.3200, TMN management services and telecommunications managed areas: overview	ITU-T M.3300, TMN F interface requirements
ITU-T M.3400, TMN Management Function	ITU-T Temporary Document 69 (IP Experts): Revised draft document on IP access network architecture
ITU-T X.701-X.709, Systems Management framework and architecture	ITU-T X.710-X.719, Management Communication Service and Protocol
ITU-T X.720-X.729, Structure of Management Information	ITU-T X.730-X.799, Management functions
RFC1157, Simple Network	RFC1213, Management Information

Network management standard	
Management Protocol	Base for Network Management of TCP/IP based internets: MIB-II
RFC1901, Introduction to Community-based SNMPv2	RFC1902, Structure of Management Information for Version 2 of the Simple Network Management Protocol (SNMPv2)
RFC1903, Textual Conventions for Version 2 of the Simple Network Management Protocol (SNMPv2)	RFC1905, Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)
RFC2037, Entity MIB using SMIv2	RFC2233, The Interface Group MIB using SMIv2
RFC1558, A String Representation of LDAP Search Filters	RFC1558, A String Representation of LDAP Search Filters
RFC1777, Lightweight Directory Access Protocol	RFC1778, The String Representation of Standard Attribute Syntaxes
RFC1959, An LDAP URL Format	RFC2251, Lightweight Directory Access Protocol (v3)
RFC1493, Definitions of Managed Objects for Bridges	GB901, A Service management Business Process Model
GB910，Telecom Operations Map	GB909，Generic Requirements for Telecommunications Management Building Blocks
RFC1757, Remote Network Monitoring Management Information Base	GB908，Network Management Detailed Operations Map
RFC1757, Remote Network Monitoring Management Information Base	GB914，System Integration Map
GB917, SLA Management Handbook V1.5	NMF038, Bandwidth Management Ensemble V1.0
TMF508, Connection and Service Management Information Model Business Agreement	TMF801, Plug and Play Service Fulfillment Phase 2 Validation Specification V1.0
TMF605, Connection and Service Management Information Model	NMF037, Sub-System Alarm Surveillance Ensemble V1.0
TMF053, NGOSS Architecture Technology Neutral Specification V1.5	TMF053A, NGOSS Architecture Technology Neutral Specification V1.5
TMF053B, NGOSS Architecture	TMF821, IP VPN Management

Network management standard	
Technology Neutral Specification V1.5	Interface Implementation Specification V1.5
TMF816, B2B Managed Service for DSL Interface Implementation Specification V1.5	Interworking Between CORBA and TMN System Specification V1.0
YD/T 852-1996 TMN General Design Principle	YD/T 871-1996 TMN Generic Information model
YD/T XXXX-2001 General Technical Requirements of Broadband Metro Network	YD/T XXXX-2001 IP Network Technical Requirements – Network Performance Indexes and Availability
YD/T XXXX-2000 IP Network Technical Requirements – General Network Structure	YDN 075-1998 China Public Multimedia Telecommunication Network Management Specifications
YDN 075-1998 China Public Multimedia Telecommunication Network Management Specifications	RFC 1215 A Convention for Defin-ing Traps for use with the SNMP
RFC 1657 BGP4-MIB	RFC 1724 RIPv2-MIB
RFC 1850 OSPF-MIB	RFC 1907 SNMPv2-MIB
RFC 2096 IP-FORWARD-MIB	RFC 2011 IP-MIB
RFC 2012 TCP-MIB	RFC 2013 UDP-MIB
RFC 2138 RADIUS	RFC 2206 RSVP-MIB
RFC 2452 IPv6 Management Information Base for theTransmission Control Protocol	RFC 2454 IPv6 Management Information Base for the User Datagram Protocol
RFC 2987 VRRP-MIB	RFC 3014 NOTIFICATION-LOGMIB
RFC 3019 IP Version 6 Manage-mentInformation Base for The Multicast Listener Discovery Protocol	RFC 3164 Syslog
draft-ietf-disman-alarm-mib-04.txt	draft-ietf-ospf-mib-update-04.txt
draft-ietf-isis-wg-mib-05.txt	draft-ietf-mpls-lsr-mib-06.txt
draft-ietf-mpls-te-mib-04.txt	draft-ietf-mpls-ldp-mib-07.txt

5 Technical indices and specifications

5.1 Physical performance

Table 5-1 Equipment physical performance list

Attribute		Description
Equipment physical dimensions	Subrack mm (width × height × depth)	482.6*530.6*285
Cabinet dimensions	2000mm*600mm*300mm	19”
	2200mm*600mm*300mm	19”
Slot number	Total slot number	24
	Service slot	18 (8 full-height slots + 10 half-height slots)
Power supply	Power supply condition (DC)	-48 V, -38.4V~-57.6V
	Representative power consumption	1400W
Environment requirements	Operating environment temperature	-5℃～+45℃
	Storage environment temperature	-40℃～+70℃
	Relative humidity	5%～95%, non-congealing
	Earthquake-resistance	Resist earthquake of magnitude 9
Equipment reliability	MTBF	>300000h
	MTTR	<0.5 h
	Reliability	≥99.999%
	Redundancy backup for main control	1+1 redundancy
	Redundancy backup for power supply	One 1+1 redundancy for DC power supply
Heat	Heat load with full	4778.2

Attribute		Description
dissipation	capacity (BTU/h)	

Table 5-2 The physical performance list of the ZXCTN 6500-16

Attribute		Description
Equipment physical dimensions	Subrack mm (width × height × depth)	535*1022*285
Cabinet dimensions	2000mm*600mm*300mm	21”
	2200mm*600mm*300mm	21”
Slot number	Total slot number	55
	Service slot	16 full-height slots+ 28 half-height slots
Power supply	Power supply condition (DC)	-48V, -38.4~-57.6V
	Representative power consumption	2800W
Environment requirements	Operating environment temperature	-5℃～+45℃
	Storage environment temperature	-40℃～+70℃
	Relative humidity	5%～95%, non-congealing
	Earthquake-resistance	Resist earthquake of magnitude 9
Equipment reliability	MTBF	>300000h
	MTTR	<0.5 h
	Reliability	≥99.999%
	Redundancy backup for main control	1+1 redundancy
	Redundancy backup for power supply	Two 1+1 redundancy protection for DC power supply
Heat dissipation	Heat load with full capacity (BTU/h)	9556.4

Table 5-3 The physical performance list of the ZXCTN 6500-32

Attribute		Description
Equipment physical dimensions	Subrack mm (width × height × depth)	482.6*1552.9*285
Cabinet dimensions	2000mm*600mm*300mm	19”
	2200mm*600mm*300mm	19”
Slot number	Total slot number	58
	Service slot	32 full-height slots
Power supply	Power supply condition (DC)	-48V, -38.4V~-57.6V -60V,-48V~-72V
	Representative power consumption	4200W
Environment requirements	Operating environment temperature	-5℃～+45℃
	Storage environment temperature	-40℃～+70℃
	Relative humidity	5%～95%, non-congealing
	Earthquake-resistance	Resist earthquake of magnitude 9
Equipment reliability	MTBF	>300000h
	MTTR	<0.5 h
	Reliability	≥99.999%
	Redundancy backup for main control	1+1 redundancy
	Redundancy backup for power supply	Four 1+1 redundancy protection for DC power supply
Heat dissipation	Heat load with full capacity (BTU/h)	14334.6

Remarks: subrack weight doesn’t cover card, fan chassis or anti-dust chassis.

5.2 Interface indices

Table 5-4 E1 interface electric performance

Electric performance	Index
Nominal rate	2.048Mbit/s
Code pattern	HDB3 (High Density Bipolar 3 code)
Allowable attenuation of input interface (attenuation in square root pattern)	0dB～6dB，1024kHz
Allowable frequency deviation of input interface	＞±50ppm
Bit rate error tolerance of output interface	＜±50ppm
Output interface jitter	Comply with ITU-T G.823 Table 1/Figure 1
Output signal waveform	Comply with ITU-T G.703 Figure 15
Anti-interference capability of input interface (S/N)	18dB
Input jitter and wander tolerance	Comply with ITU-T G.823 Figure 13
Reflection attenuation	Comply with ITU-T G.703 §9.3

Table 5-5 STM-1 optical interface performance

Type	Performance		
Nominal rate	155520kbit/s		
Code pattern	NRZ scrambling codes (scrambling codes to meet the ITU-T G.707 requirements for seven synchronization scrambler scrambling code)		
Optical type	S1.1	L1.1	L1.2
wavelength(nm)	1310nm	1310nm	1550nm
Transmission distance	＜15km	＜40km	＜80km
Connector	LC/PC	LC/PC	LC/PC
Mean transmitting power	-15～-8 dBm	-5～0 dBm	-5～0dBm

Type	Performance		
Minimum extinction ratio	8.2dB	10.2dB	10.2dB
Receiver sensitivity	-28 dBm	-34 dBm	-34 dBm
Receiver overload optical power	-8dBm	-10dBm	-10dBm
Allowable frequency deviation of optical input interface	>±20 ppm		
AIS rate of optical output interface	Within ±20 ppm		

Table 5-6 STM-4 optical interface performance

Type	Performance		
Nominal rate	622080kbit/s		
Code pattern	NRZ scrambling codes (scrambling codes to meet the ITU-T G.707 requirements for seven synchronization scrambler scrambling code)		
Optical type	S4.1	L4.1	L4.2
wavelength(nm)	1310nm	1310nm	1550nm
Transmission distance	＜15km	＜40km	＜80km
Connector	LC/PC	LC/PC	LC/PC
Mean transmitting power	-15～-8 dBm	-3～2 dBm	-3～2dBm
Minimum extinction ratio	8.2dB	10dB	10dB
Receiver sensitivity	-28 dBm	-28 dBm	-28 dBm

Type	Performance		
Receiver overload optical power	-8dBm	-8dBm	-8dBm
Allowable frequency deviation of optical input interface	>±20 ppm		
AIS rate of optical output interface	Within ±20 ppm		

Table 5-7 10/100Base-TX interface electric performance

Type		performance
Standard compliance		IEEE 802.3z
Nominal rate		10/100Mbit/s
Pattern	10Mbit/s	Manchester Encoding
	100Mbit/s	MLT-3 Encoding
Interface		RJ45
Maximum transmission distance		100m
Transmission medium		Category 5 UTP twisted-pair

Table 5-8 GE interface optical performance

Type	performance			
Nominal rate	1000 Mbit/s			
Interface type	1000BASE-SX（0.5km）	1000BASE-LX（10km）	1000BASE-LX（40km）	1000BASE-ZX（80km）
Connector type	LC	LC	LC	LC
Fiber type	multimode fiber	single mode fiber	single mode fiber	single mode fiber
wavelength(nm)	850	1310	1310	1550
Transmitting	-9.5～-4	-9～-3	-4～5	0～5

Type	performance			
power range(dBm)				
receiving sensitivity(dBm)	≤-17	≤-20	≤-22	≤-22

Table 5-9 10GE interface optical performance

Type	performance			
Nominal rate	10000 Mbit/s			
Interface type	10GBASE-SR（0.3km）	10GBASE-LR（10km）	10GBASE-ER（40km）	10GBASE-ZR（80km）
Connector type	LC	LC	LC	LC
Fiber type	multimode fiber	single mode fiber	single mode fiber	single mode fiber
wavelength(nm)	850	1310	1550	1550
Transmitting power range(dBm)	-7.3～-1	-5～-1	0～2	1～4
receiving sensitivity(dBm)	≤-11.1	≤-14	≤-16.5	≤-26

Table 5-10 40GE optical interface parameters

Item	Performance indice	
Nominal rate	40000 Mbit/s	
Optical interface type	40GBASE-LR4	40GBASE-ER4
Connector type	LC	LC
Fiber type	Single mode	Single mode
Central wavelength (nm)	1264.5 to 1277.5 1284.5 to 1297.5 1304.5 to 1317.5 1324.5 to 1337.5	1264.5 to 1277.5 1284.5 to 1297.5 1304.5 to 1317.5 1324.5 to 1337.5
Average transmitting optical power (total) (maximum) dBm	8.3	<10
Average transmitting optical	2.3	4.5

Item	Performance indice	
power (each lane) (maximum) dBm		
Average transmitting optical power (each lane) (minimum) dBm	-7	0
Average transmitting optical power when transmitter is shutdown (each lane) (maximum) dBm	-30	< -30
Extinction ratio (minimum) dB	3.5	5.5
Average receiving optical power (each lane) (maximum) dBm	2.3	2.3
Receiving sensitivity dBm	-11.1	-20
Return loss dB	-26	-26

5.3 System Function List

5.3.1 Function Parameters

Table 5-11 List of service parameter

Attribute		Description (6500-8/16/32)
L2 feature	MAC address table capacity	512K
	MAC address learning speed	100K/s
	VLAN number	Interface: 4094. The entire device: 256K.
	LAG group	128/128/256
	Maximum port number of each LAG group	8
	L2 multicast table	8K
	L2 multicast add-in and leave-off time	<200ms
L3 feature	ARP table	64K

Attribute		Description (6500-8/16/32)
	ARP learning speed	10K/s
	IPv4 host routing table	2M
	IPv4 FIB	1M
	L3 interface table	4K
	OSPF neighbors	2K
	BGP neighbors	4K
	VRRP groups	1K
QoS	Speed control granularity	100/1000M port: 64K
		10G/40GE port: 256K
	Queue number	5-level H-QoS, 16K per slot
	Minimum device forwarding latency	≤50us
	ACL items	16K/32K/64K
VPN	VPWS	32K
	VPLS instances	8K
	VPLS MAC	512K
	L3 VPN VRF entity	4K
Service Performance	LSP number	64K
	PW number	64K
	Ethernet OAM entity number (EFM)	128/256/512
	Ethernet OAM entity number (CFM)	16K
	MPLS-TP OAM entity number (TMC/TMP/TMS)	16K
	Ring protection group number	64
	MPLS-TP wire-speed protection group	16K
	STM-NAPS protection group number	64
	Active/standby switchover time	<50ms
NM Performance	telnet user number	16

5.3.2 L2 features

Table 5-12 L2 features

Attribute		Description
L2 features	VLAN	Support port-based VLAN
	QinQ	Support QinQ-based forwarding Support common QinQ and port-based outer layer label Support Selective QinQ and traffic-based outer layer label Support Selective QinQ inner priority mapping Support TPID modification
	MAC	Support MAC address learning, aging, filtering and binding. Support MAC address management. Support static MAC address setting
	LAG	Support static configuration and automatic configuration of LACP Support traffic-based load balance Support cross-LIC aggregation
	Storm Suppression	Support broadcasting packet suppression Support multicast packet suppression Support unknown packet suppression Support unknown unicast/multicast discarding Support unknown unicast/multicast broadcasting
	Port	Support ingress mirroring, egress mirroring Support port traffic control service
	L2 Multicast	Support IGMP Snooping
	DHCP	Support DHCP Relay

5.3.3 L3 features

Table 5-13 L3 features

Attribute	Description

Attribute		Description
Basic L3 functions	L3 Interface	Support VLAN-based L3 interface
	Protocols and functions	Support ARP protocol
		Support ICMP protocol
		Support UDP protocol
		Support TCP protocol
		Support VRRP protocol
		Support IP FRR
		Support IPv4 unicast route forwarding
		Support static route
		Support OSPF routing protocol
		Support BGP routing protocol
		Support ECMP

5.3.4 QoS features

Table 5-14 QoS features

Attribute		Description
QoS feature	Traffic classification	The traffic classification based upon the physical port The traffic classification based upon ACL
	Traffic policing	Support traffic-based CAR and dual-token bucket. Support ingress/egress traffic policing. Support color sensitivity and color bind services
	Congestion control	Bandwidth control based upon the queue Support WRED, Red and Taildrop. Support anti-HOL blocking service. Support self-adaptive threshold management.
	Queue scheduling	Support 8-priority queue. Each queue supports the minimum/maximumbandwidth management. Support WFQ, and WFQ+SP scheduling.
	Traffic shaping	Support port-based traffic shaping. Support tunnel-based traffic shaping.

Attribute		Description
		Support PW-based traffic shaping. Support the traffic shaping based upon the client stream (as per the ACL).
	H-QoS	Support 5-level hierarchical QoS: port, Tunnel/LSP, Path/PW, VLAN ID and COS.

5.3.5 Reliability

Table 5-15 ZXCTN 6500 provides network-class protection

Attribute	Description
Reliability	Support MPLS-TP end-to-end path protection. Support WRAPPING ring protection. Support shared ring protection. Support dual-homing protection.

5.3.6 Clock synchronization

Table 5-16 Clock synchronization

Attribute		Description
Clock synchronization	Synchronization Ethernet	Support port-based clock recovery Support entire clock distribution. Support clock abstraction (line, external 2Mbit/s clock and GPS clock). Support SSM processing service.Support the mapping of the SSM information to 1588 message.
	IEEE 1588v2	Support clock transparent transmission. Support precise time synchronization. Support multi-session. Support BCM algorithm.
	Pulse phase synchronization	Support 1PPS second pulse interface.

5.3.7 Tunnel feature

Table 5-17 Tunnel feature

Attribute	Description
PWE3 circuit emulation	Support PWE3 circuit emulation of E1, STM-N, and ETHERNET port.
TDM circuit timeslot	Support self-adaptive clock recovery. Support E1 retiming. Support differential clock. Support loopback clock.
MPLS-TP tunnel	Support MPLS-TP tunnel.

5.3.8 Operation and Maintenance

Table 5-18 Operation and maintenance

Attribute		Description
Operation and Maintenance	Operation and Maintenance	Support command line service Support remote access in the manner of SSH, TELNET, WEB, and SNMP. Support multiple sorts of alarm (sound and light warning platform) Support unified NM CLI supports hierarchical NM Support user access control service Support recovery of configuration storage Support operation log record service Support alarm log management service Support basic MIB service Support traffic statistic service Support Ping Support Trace
	OAM	Support MPLS-TP OAM Support Ethernet link OAM Support Ethernet OAM

5.4 Weight and Power Consumption of the Board

Table 5-19 Weight and power consumption for the board

Board	Weight(kg)	Power Consumption(W)
PSA	1.98	80
PSB	2.1	80
NCPSA	2.28	112
NCPA	1.96	50
NCPB	1.95	50
PWRA	0.88	13
PWRB	0.88	15
SAIA	0.44	17
SAIB	0.44	17
PWMSA	1.32	76
PGEAx16	1.38	99
PGEAx8	1.3	65
PXGAx2	1.41	90
PXGAx4	1.44	110
PXLGAx1	1.44	95
PS1Cx4	1.34	38
RE1PI-75	1.04	10
RE1PI-120	1.04	10
R63E1U	0.56	30
R8HGE	0.47	28
R8HGF	0.5	30
R4CSB	0.47	23
R4CEP	0.44	22
R8FEF	0.46	23
R8FEI	0.43	18

5.5 Reliability Index of the Component

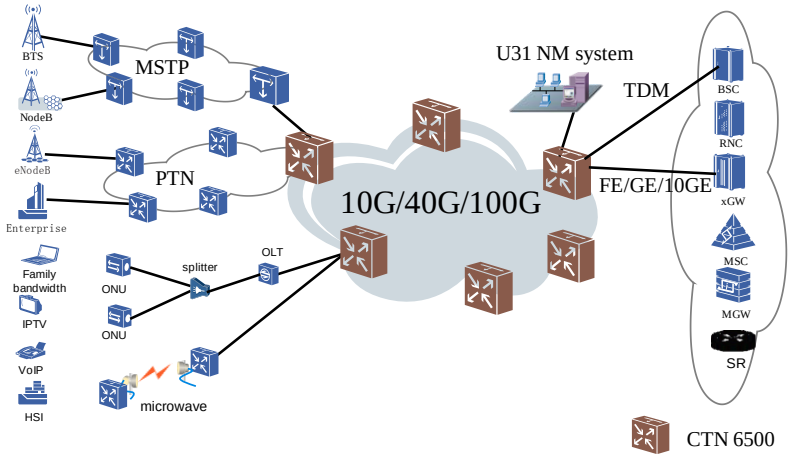
The component reliability indicates the reliability of this component.

Table 5-20 The component reliability

Component	FIT/ λ（10-9/h)	MTBF (h)	MTTR (h)
PSA	687	1455600	0.5
PSB	687	1455600	0.5
NCPSA	1306	765700	0.5
NCPA	1170	854600	0.5
NCPB	1170	854600	0.5
PWRA	157	6370000	0.5
PWRB	157	6370000	0.5
SAIA	580	1724000	0.5
SAIB	580	1724000	0.5
PWMSA	1200	830000	0.5
PGEAx16	1222	819000	0.5
PGEAx8	1222	821300	0.5
PXGAx2	1373	785550	0.5
PXGAx4	1373	728330	0.5
PXLGAx1	1223	817600	0.5
RE1PI-75	355	2817000	0.5
RE1PI-120	355	2817000	0.5
R63E1U	371	2700000	0.5
R8EGE	502	1992000	0.5
R8EGF	466	193000	0.5
R4CSB	363	2755000	0.5
R4CEP	363	2755000	0.5
FCP	160	6250000	0.5
R8FEF	500	2000000	0.5
R8FEI	466	2146000	0.5

6 Integrated networking application of the products

Figure 6-1 ZXCTN 6500 backhaul&FMC solution



ZXCTN Backhaul&FMC bearing solution is applicable to the evolving mobile network. The solution takes universal packet switching as the core, targets multi-service support and highly efficient transport, fully addressing the bearing requirements in backhaul&FMC.

7 Operation and Maintenance

7.1 Unified NM platform

ZXCTN 6500 employs NetNumen U31 to perform unified management and monitoring for all NEs, offering configuration management, fault management, performance management, Maintenance management, ETE circuit management, security management, system management and report management functions.

NetNumen U31 is the network management system based on distributed and plug-in design, serving as the unified management platform for all ZTE optical transmission series. With multiple network management techniques, the system is designed and developed in line with ITU-T TMN concept, enabling management and control of NE

and regional network on basis of ensuring transmission equipment functions. It offers robust NE management function, end-to-end management function and flexible networking capability.

7.2 Maintenance and Management

7.2.1 Equipment management

Support maintenance and management interface running in command line, and perform NE management and configuration.

Support remote access via SSH. Support remote access via SSH V1/V2, and allow NM server to communicate with the equipment.

Support Telnet management.

- The equipment allows up to four Telnet users to log in to NE for configuration management;
- Support ACL access control of Telnet access users.

Support SNMP protocol.

- Enable query of NE parameter setting and running state via GET/SET operations in SNMP protocol;
- Support ACL access control of SNMP access users.

Provide NM interface management. Enable access of NE via this interface to implement NE management and configuration.

Provide FTP/Telnet interface. The equipment has FTP/Telnet server and client functions.

NE communication management.

- Intercommunication of in-band management control information;
- Intercommunication of out-of-band management control information;

- Network management interoperability;
- Routing and forwarding of NM information;
- Unified NM function.

7.2.2 Supervision and Maintenance

ZXCTN 6500 performs equipment monitoring, management and maintenance via multiple means, enables the equipment to perform corresponding exception handling in case of occurrence of various exceptions, and offers user with all parameters during equipment operation.

Offer eight external alarm input interfaces, five external alarm output interfaces to ease equipment operation and maintenance;

Running, alarm state indicators are available at power supply, fan, main control and all service boards, helping network administrator localize and handle failures in time;

Support automatic online optical power detection and automatic shutdown of laser for optical interface;

The system monitors the software running state, and performs line card restart or master-slave switching of main control board in case of occurrence of exceptions affecting equipment's normal operation;

Command line offers agile online help for network management;

Support online backup and loading of database, restore system configuration by means of database;

Provide hierarchical user authority management and hierarchical command; Support query of operation log, enable trace back of operation and maintenance operations to localize fault reason and demarcate the liability of fault;

Support packet loading and remote loading of board and host software, and provide mis-loading prevention and segmented download functions.

7.2.3 Diagnosis and Debugging

ZXCTN 6500 provides multiple diagnosis and debug measures, allowing users to have a wider variety of methods and acquire more debug information during

equipment debug.

Ping and TraceRoute: check whether network connection is reachable; record the transmission route of packet online, serving as reference for fault localization.

Debugging: provide rich debug commands targeting each software feature, each debug command supports multiple debug parameters under flexible control. Debug command can be used to output in details the processing, message transmitting/receiving and error checking information during running of the feature.

Mirror function: support port-based mirror function, the messages from input, output or both directions of observed interface are copied intact to the observing interface.

7.2.4 Software Upgrade

ZXCTN 6500 supports local or remote FTP online upgrade.

Upgrade main control board by means of master-slave protection for main control.

When other boards (in addition to main control board) with master-slave protection perform board software upgrade, the services will not be disconnected typically, or the disconnection time is less than 50ms.

Support mis-loading prevention for software, rollback when upgrade fails, and the upgrade process is reversible.

8 Environment Indices

8.1 Storage

8.1.1 Climate Environment

The climate requirements for equipment storage are described in 错误！未找到引用源。.

Table 8-1 Requirements for climate (storage environment)

Item	Index
Altitude	≤4000 m
Air pressure	62kPa ~ 106kPa
Temperature	-40 ℃ ~ +70 ℃
Temperature variance ratio	≤1 ℃/min
Relative humidity	10% ~ 100%
Solar radiation	≤1120 W/s^2
Heat radiation	≤600 W/s^2
Wind speed	≤30m/s

8.1.2 Water-proof Requirement

Storage requirements for on-site equipments: keep the equipments indoor.

Ensure that there is no water on the storage room floor, so that the water will not leak on the packing container of the equipment. Furthermore, the storage position should be far away from the leaking places of the firefighting equipment and heating system.

If the equipment has to be stored outside, the requirements are listed as follows:

Ensure that the packing of the equipment is in good condition without any damages.

Rainwater-proof measures should be taken, so that the rainwater can not damage the pack of the equipment.

Ensure that no water in the storage place, so that the packing container of the equipment will not be leaked.

Keep the packing container out of direct sunlight.

8.2 Transportation

8.2.1 Climate Environment

The climate requirements for equipment transportation are described in 错误！未找到引用源。.

Table 8-2 Requirements for climate (transportation environment)

Item	Index
Altitude	≤4000 m
Air pressure	62kPa ~ 106kPa
Temperature	-50 ℃ ~ +70 ℃
Temperature variance ratio	≤1 ℃/min
Relative humidity	10% ~ 100%
Solar radiation	≤1120 W/s^2
Heat radiation	≤600 W/s^2
Wind speed	≤30 m/s

8.2.2 Water-proof Requirements

Storage requirements for on-site equipments: keep the equipments indoor.

Ensure that there is no water on the storage room floor, so that the water will not leak on the packing container of the equipment. Furthermore, the storage position should be far away from the leaking places of the firefighting equipment and heating system.

If the equipment has to be stored outdoor, requirements are listed as follows:

Ensure that the packing of the equipment is in good condition without any damages.

Rainwater-proof transportation tools should be provided, so that the rainwater can not damage the pack of the equipment.

Ensure that no water in transportation tools.

8.3 Running

The environment temperature and relative humidity requirements for equipment running are described in 错误！未找到引用源。, other climate environment requirements are described in 错误！未找到引用源。.

Table 8-3 Temperature and humidity requirements (running environment)

Item	Specifications
Environment temperature	-5 ℃~+45 ℃
Relative humidity	5%~95%

Note: temperature and humidity are measured 1.5m above the floor and 0.4m in front of the equipment. Short term running means that the equipment works continuously for no more than 96 hours and works for no more than 15 days in one year.

Table 8-4 Other climate environment requirements (running environment)

Item	Index
Altitude	≤4000 m
Air pressure	62 kPa ~ 106kPa
Temperature variance ratio	≤30 ℃/h
Solar radiation	≤700 W/s^2
Heat radiation	≤600 W/s^2
Wind speed	≤5 m /s

8.4 Electromagnetic Compatibility (EMC)

EMC include anti-interference and interference.

8.4.1 Criteria

The following four criteria for test results should be determined before describing the requirements for electromagnetic compatibility, as shown in 错误！未找到引用源。.

Table 8-5 Criteria for test results

Criteria	Description
Performance A	Digital signal port: The equipment runs normally in the test. The bit error quantity does not exceed the maximum of the normal requirement after single electromagnetic interference (The maximum is 0 here). Analog audio signal port: The connection is always normal in the test. The noise signal of the test equipment (EUT), measured with 600Ω impedance, does not exceed -40 dBm.
Performance B	Digital signal port: The electromagnetic interference temporarily lowers the functions of the equipment which will automatically return to normal after the interference disappears. There is no frame loss, synchronization loss and alarm between interferences. Analog audio signal port: The connection is always normal, but the disconnection is allowed in the surge test. The test equipment (EUT) will return to normal after the interference disappears.
Performance C	The electromagnetic interference temporarily lowers the functions of the equipment which will return to normal automatically or manually after the interference disappears.
Performance R	The equipment has no loss or fault (e.g., software damage and wrong operation of protection equipment), and runs properly in the defined range after Transient EMC phenomenon disappears. The interference may affect the fuse or other defined equipment. The fuse can be replaced or the equipment can be reset before normal operation.

8.4.2 Anti-interference

1. Electronic Static Discharge (ESD) immunity

ESD immunity index is shown in 错误！未找到引用源。.

Table 8-6 ESD immunity

Contact discharge	Air discharge	Criterion for test results
6 kV	8 kV	Performance B

Note: It is compliant with IEC61000-4-2 and GB/T 17626.2-1998, General Low Voltage Directive for Electrical and Electronic Product (73/23/EEC--- Low Voltage Directive), and 89/336/EEC---EMC Directive

2. RF electromagnetic field radiation immunity (RS)

RF electromagnetic field radiation immunity index is shown in 错误！未找到引用源。.

Table 8-7 RF electromagnetic field radiation immunity Resistance

Test frequency 80 MHz ~2 GHz		
Electric field intensity	Amplitude modulation	Criterion for test results
10 V/m	80%AM (1 kHz)	Performance A

Note: It is compliant with IEC61000-4-3, and GB/T 17626.3-1998,

3. Electric Fast Transient (EFT) immunity

（1） DC port immunity (direct coupling)

DC port immunity is shown in 错误！未找到引用源。.

Table 8-8 DC port immunity

Generator waveform	Test voltage	Repetition frequency	Criterion for test results
5 ns/50 ns	±1 kV	5 kHz	Performance B

Note: It is compliant with IEC61000-4-4 and GB/T 17626.4-1998.

（2） AC port immunity (direct coupling)

AC port immunity index is shown in 错误！未找到引用源。.

Table 8-9 AC port immunity

Generator waveform	Test voltage	Repetition frequency	Criterion for test results
5 ns/50 ns	±2 kV	5 kHz	Performance B
5 ns/50 ns	±2 kV	5 kHz	Performance B

Note: It is compliant with IEC61000-4-4 and GB/T 17626.4-1998.

（3） Signal line and control line port immunity (using capacitor coupling pliers)

Signal line and control line port immunity index is shown in 错误！未找到引用源。.

Table 8-10 Signal line and control line port immunity

Generator waveform	Test voltage	Repetition frequency	Criterion for test results
5 ns/50 ns	±1 kV	5 kHz	Performance B

Note: It is compliant with IEC61000-4-4 and GB/T 17626.4-1998.

4. Lightning surge immunity

（1） DC lightning surge immunity index is shown in 错误！未找到引用源。.

Table 8-11 DC lightning surge immunity

Generator waveform:1.2 μs/50 μs（8 μs/20 μs）			
Test mode	Internal resistance	Test voltage	Criterion for test results
Line-to-line	2 Ω	±1 kV	Performance B
Line-to-ground	12 Ω	±2 kV	Performance B

Note: It is compliant with IEC61000-4-5 and GB/T 17626.5-1998.

（2） AC lightning surge immunity index is shown in 错误！未找到引用源。.

Table 8-12 AC lightning surge immunity

Generator waveform:1.2 μs/50 μs（8 μs/20 μs）			
Test mode	Internal resistance	Test voltage	Criterion for test results
Line-to-line	2 Ω	±4 kV	Performance B
Line-to-ground	12 Ω	±6 kV	Performance B

Note: It is compliant with IEC61000-4-5 and GB/T 17626.5-1998.

（3） Outdoor signal line surge immunity index is shown in 错误！未找到引用源。.

Table 8-13 Outdoor signal line surge immunity

Generator waveform:10 μs/700 μs			
Test mode	Internal resistance	Test voltage	Criterion for test results
Line-to-ground	40 Ω	±2 kV	Performance B

（4） Signal line (>10m) surge immunity index is shown in 错误！未找到引用源。.

Table 8-14 Signal line (>10m) surge immunity

Generator waveform:1.2 μs/50 μs（8 μs/20 μs）			
Test mode	Internal resistance	Test voltage	Criterion for test results
Line-to-ground	42 Ω	±1 kV	Performance B

5. RF field conductivity immunity (CS)

RF field conductivity immunity index is shown in 错误！未找到引用源。.

Table 8-15 RF field conductivity immunity

Test frequency:0.15 MHz~80 MHz		
Test intensity	Amplitude modulation	Criterion for test results
3V	80%AM (1 kHz)	Performance A

Note: It is compliant with IEC61000-4-6 and GB/T 17626.6-1998.

6. Transient voltage dip and short interruption immunity

（1） AC transient voltage dip and short interruption immunity index are shown in 错误！未找到引用源。.

Table 8-16 AC transient voltage dip and short interruption immunity

Voltage reduction rate	Duration (ms)	Criterion for test results
>95%	50	Performance B
30%	500	Performance C
>95%	5000	Performance C

Note: The index is only applied to AC power supply (PWB board). It is compliant with IEC61000-4-11 and GB/T 17626.11-1999.

（2） DC transient voltage dip and short interruption immunity index are shown in 错误！未找到引用源。.

Table 8-17 DC transient voltage dip and short interruption immunity

Index	Voltage variation rate	Duration (ms)	Additional condition	Criterion for test results
Voltage dip	70%	0.01	-	Performance B
		1	-	Performance C
	40%	0.01	-	Performance B
		1	-	Performance C
Short interruption	0	0.001	High impendence (Trial generator outputs the impedance)	Performance B
		5		Performance C
	0	0.001	High impendence (Trial generator outputs the impedance)	Performance B
		5		Performance C
Voltage variation	80%	0.1	-	Performance A
		10	-	Performance A
	120%	0.1	-	Performance A
		10	-	Performance A

Note: The index is only applied to DC power supply (PWA board). It is compliant with IEC61000-4-11 and GB/T 17626.11-1999.

7. Voltage fluctuation and flicker immunity

AC port voltage fluctuation immunity index is shown in 错误！未找到引用源。.

Table 8-18 AC port voltage fluctuation immunity

Voltage reduction rate	Duration (ms)	Criterion for test results
95%	10	Performance B
30%	500	Performance C
95%	5000	Performance C

8.4.3 Interference features

The interference consists of conducted emission and radiated emission. The indexes are compliant with CISPR 22 and GB 9254 Class A.

1. Conducted emission

（1） DC/AC port conducted emission index is shown in 错误！未找到引用源。.

Table 8-19 DC/AC port conducted emission

Test frequency (MHz)	Voltage limit value (dBμV)	
	Quasi-peak value	Average value
0.15~0.50	79	66
0.50~30.00	73	60

（2） Ethernet/E1 port conducted emission index is shown in 错误！未找到引用源。.

Table 8-20 Ethernet/E1 port conducted emission

Test frequency (MHz)	Voltage limit value (dBμV)	
	Quasi-peak value	Average value
0.15~0.50	97~87	84~74

Test frequency (MHz)	Voltage limit value (dBμV)	
	Quasi-peak value	Average value
0.50~30.00	87	74

2. Radiated emission

Radiated emission strength index is shown in 错误！未找到引用源。.

Table 8-21 Radiated emission strength

Test frequency (MHz)	Quasi-peak limit value (dBμV/m)	
	Test distance 10m	Test distance 3m
30~230	40	50
230~1000	47	57

9 Abbreviation

Abbreviation	Full name
ACL	Access Control List
AG	Access Gateway
APC	Automatic Power Control
APS	Autometic Protect Switch
ASIC	Application Specific Integrated Circuit
ARPU	Average Revenue Per User
ATCA	Advanced Telecom Computing Architecture
ATM	Asyncronous Transfer Mode
BCB	Backbone Core Bridge
BEB	Backbone Edge Bridge，
BFD	Bidirectional Forwarding Detection
BGP	Border Gateway Protocol
B-MAC	Backbone MAC
BPDU	Bridge PDU
CAC	Connection Access Control
CAM	Content-addressable Memory
CAN	Controller-area Network

Abbreviation	Full name
CAPEX	Capital Expenditures
CDN	Content Distribution Network
CDR	Call Detail Record
CE	Carrier Ethernet
CESoPSN	Circuit Emulation Services over PSN
CMS	Center Media Server
CV	Connectivity Verification
DoS	Denial of Service
DPI	Deep Packet Inspection
DVMRP	Distance vector Multicast Routing Protocol
EAPS	Ethernet Automatic Protection Switching
ECMP	Equal Cost of Multi－path
E-LAN	Ethenet LAN
E-LINE	Ethernet LINE
EMS	Edge Media Server
ESRP	Ethernet tandby Routing Protocol
E-TREE	Ethernet TREE
FDDI	Fiber Distributed Digital Interface
FFD	Fast Failure Detection
FR	Frame－relay Protocol
FRR	Fast Reroute
GFP	General Format Protocol
GPS	Global Position System
GR	Graceful estart
HDLC	High Level Data Link Control
H-VPLS	Hierarchical Virtual Private Lan Servie
IAD	Integrated Access Device
ICMP	Internet Control Message Protocol
IGMP	Internet Group Management Protocol
IMA	Inverse Multiplexing for ATM
IPMS	Intelligent Platform Message sub-system

Abbreviation	Full name
IPMC	Intelligent Platform Message control
IPOE	IP over Ethernet
IPS	Intrusion Detection Systems
IPMB	Intelligent Platform Message Bus
ISIS	Intermediate System－Intermediate System
LACP	Link Aggregation Control Protocol
LIC	Line Interface Card
LPC	Line Process Card
LSP	Label Switch Path
MCE	Multi-instance Custmer Edge
MPLS	Multi－Protocol Label Swtiching
MSG	Media Service Gateway
MSTP	Multiple SpanningTree Protocol
MTU	Maximum Transmission Unit
MVR	Multicast VLAN Registration
NE	Network Element
NGN	Next Generation Network
OAM	Operations Administration and Maintainence
OPEX	Operation Expense
OSPF	Open Shortest Path First
PIM	Protocol Independent Multicast
PIM-DM	Protocol Independent Multicast－Dense Mode
PIM-SM	Protocol Independent Multicast－Sparse Mode
PIM-SSM	Protocol Independent Multicast－Source Specific Multicast
PMD	Physical Medium Dependent
POS	Packet over SDH
PPP	Point to Point Protocol
PPPOE	PPP over Ethernet
PRV	Preview
PSN	Packet Switch Network
PUPSPV	Per User Per Service Per VLAN

Abbreviation	Full name
PVLAN	Private VLAN
PW	Pseudo－wire
PWE3	PW Emulation End to End
RED	Random Early Detection
RIP	Routing Information Protocol
RNC	Radio Network Controller
ROS	Routing Operation System
RP	Rendezvous Point
RPR	Resilient Packet Ring
RSTP	Rapid SpanningTree Protocol
SAToP	Structure-Agnostic TDM over PSN
SDH	Synchronous Digital Hierarchy
SLA	Service Level Agreement
SMS	Service Management System
SNMP	SimpleNetwork Management Protocol
SSM	Source Specific Multicast
STP	Spanning Tree Protocol
SyncE	Synchronization Ethernet
SVLAN	Select VLAN
TCO	Total Cost of Ownership
TCP	Transport Control Protocol
TDM	Time Division Multiplex and Multiplexer
TL1	Transaction Language 1
TM	Traffic Manager
UDP	User Datagram Protocol
URPF	*Unicast Reverse Path Forwarding*
VLL	Virtual Leased Line
VOIP	Voice over IP
VPLS	Virtual Private Lan Servie
VPN	Virtual Private Network
VPWS	Virtual Private Wire Service

Abbreviation	Full name
VRF	*Virtual Routing and Forwarding*
VRRP	Virtual Router Redundancy Protocol
WRED	Weighted Random Early Detection
WFQ	Weighted Fair Queuing
ZESR	ZTE Ethernet Smart Ring
ZESS	ZTE Ethernet Smart Switching
ZGMP	ZTE Group Management Protocol
ZGMS	ZTE General Multicast System
ZTP	ZTE Topology Discovery Protocol

10 Standards and recommendations

10.1 IETF

RFC 1661 Point-to-Point Protocol

RFC 1990 PPP Multilink Protocol

RFC 2686 Multi-Class Extension to Multi-Link PPP

RFC 3916 PWE3 requirements

RFC 3965 PWE3 structure

RFC 4026 Provider Provisioned Virtual Private Network (VPN) Terminology

RFC 4446 IANA Allocations for PWE3

RFC 4448 Encapsulation of Ethernet over MPLS

RFC 4553 Structure-Agnostic TDM over Packet

RFC 4664 L2VPN structure

RFC 4665 L2VPN requirements

RFC 4717 Encapsulation for ATM over MPLS

RFC 4816 ATM Transparent Cell Transport Service

RFC 5086 Structure-aware TDM Circuit Emulation Service over Packet Switched Network (CESoPSN)

RFC5654 MPLS-TP needs

RFC5860 MPLS-TP OAM needs

RFC5921 MPLS-TP framework

RFC5960 MPLS-TP data plane framework

Draft-bhh-mpls-tp-oam-y1731-04

10.2 ITU-T

G.703 Physical/electrical characteristics of hierarchical digital interfaces

G.704 Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

G.706 Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704

G.707 Network Node Interface for the Synchronous Digital Hierarchy (SDH) (V2003)

G.774 Synchronous Digital Hierarchy (SDH) - Management Information Model

G.774.01 Synchronous Digital Hierarchy (SDH) performance monitoring for the network element view

G.774.02 Synchronous digital hierarchy (SDH) configuration of the payload structure for the network element view

G.774.03 Synchronous digital hierarchy (SDH) management of multiplex-section protection for the network element view

G.774.05 Synchronous Digital Hierarchy (SDH) management of connection supervision functionality (HCS/LCS) for the network element view

G.774.06 Synchronous digital hierarchy (SDH) unidirectional performance monitoring for the network element view

G.774.07 Synchronous Digital Hierarchy (SDH) management of lower order path trace and interface labeling for the network element view

G.7041 Generic framing procedure (GFP)

G.7042 Link capacity adjustment scheme (LCAS) for virtual concatenated signals

G.780 Terms and definitions for SDH networks

G.783 Characteristics of SDH equipment functional blocks

G.784 Synchronous digital hierarchy (SDH) management

G.803 Architecture of transport networks based on the synchronous digital

hierarchy (SDH)

G.805 Generic functional architecture of transport networks

G.810 Definitions and terminology for synchronization networks

G.811 Timing characteristics of primary reference clocks

G.812 Timing requirements of slave clocks suitable for use as node clocks in synchronization networks

G.813 Timing characteristics of SDH equipment slave clocks (SEC)

G.823 Control of Jitter and Wander within Digital Networks Which Are Based on the 2048 KBIT/S Hierarchy Series

G.825 The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)

G.826 Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate

G.831 Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)

G.832 Transport of SDH elements on PDH networks - Frame and multiplexing structures

G.841 Types and characteristics of SDH network protection architectures

G.842 Interworking of SDH network protection architectures

G.957 Optical interfaces for equipments and systems relating to the synchronous digital hierarchy

G.958 Digital line systems based on the synchronous digital hierarchy for use on optical fiber cables

I.361 B-ISDN ATM layer specification

K.41 Resistibility of internal interfaces of telecommunication centers to surge overvoltage

M.20 Maintenance principle of telecommunications network

M.2100 Performance limits for bringing-into-service and maintenance of international PDH paths, sections and transmission systems

M.2101 Performance limits for bringing-into-service and maintenance of international SDH paths and multiplex sections

M.2120 International multi-operator paths, sections and transmission systems fault detection and localization procedures

M.3010 Principles for a Telecommunications management network

M.3400 TMN management functions

Q.811 Lower layer protocol profiles for the Q3 and X interfaces

Q.812 Upper layer protocol profiles for the Q3 and X interfaces

Y.1413 TDM-MPLS network interworking - User plane interworking

Y.1731 OAM functions and mechanisms for Ethernet based networks

I.432.2 B-ISDN user-network interface -155520kbit/s and 622080kbit/s physical layer specification

I.432.3 B-ISDN user-network interface -1544kbit/s and 2048kbit/s physical layer specification

I.761 Inverse multiplexing for ATM (IMA)

10.3 IEEE

IEEE 802.3 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical

IEEE 802.1ad Virtual bridged local area networks

IEEE 802.1ag Virtual Bridged Local Area Networks – Connectivity Fault Management

IEEE 802.3ah Media Access Control (MAC) Parameters, Physical Layers and Management Parameters for Subscriber Access Networks

10.4 MEF

MEF 4 Metro network structure frame part 1 – Generic frame

MEF 6 Metro Ethernet service definition stage 1

MEF 8	PDH circuit emulation service transport specification over Metro Ethernet
MEF 10.1	Ethernet service attributes stage 2
MEF 11	UNI requirement and frame